VOLUME 34 NUMBER 6 JUNE, 1951

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OF
OPHTHALMOLOGY

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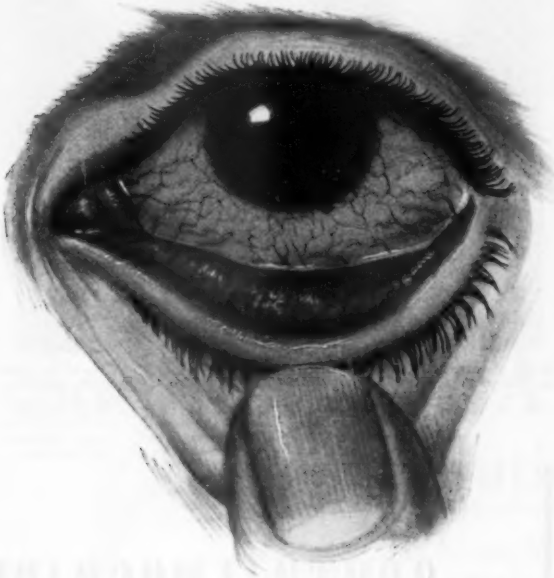

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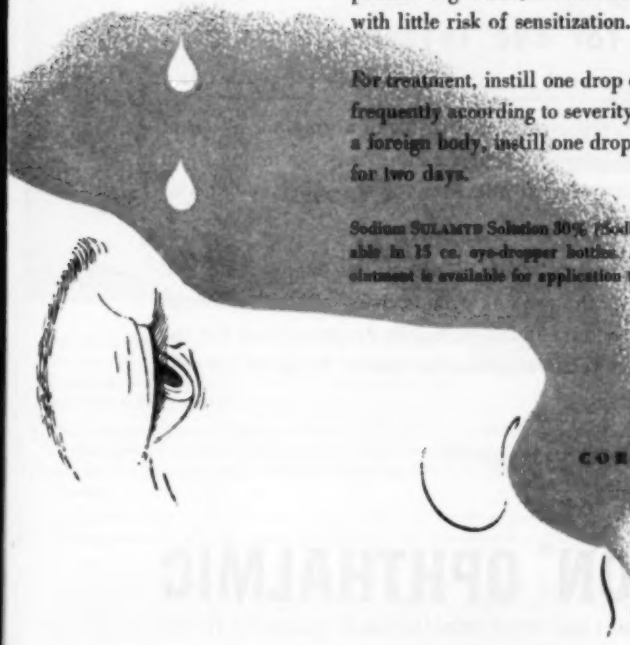

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1. Tilting the lenses pantoscopic and retroscopic. No improvement was found.
2. Grinding lenses from flat to deeply curved. No improvement.
3. Colored and tinted lenses. No results.

The solution was found by experimenting with the position of the optical centers of the lenses. It was discovered that most lenses are fitted with the optical centers from 6 mm. to 8 mm. below the pupils. The lower the optical centers the more noticeable the ghost images. When the optical centers were ground to correspond exactly with the pupillary centers, the reflection images were either entirely eliminated or made to correspond so nearly with the true images that they were not bothersome.

We suggest that whenever patients complain of reflection images, the pupillary centers be located by dotting with white ink. Next measure the distance these pupillary centers are above the geometric centers of the lenses and then order lenses with the optical centers placed to exactly coincide with the pupillary centers.

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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 34 JUNE, 1951 NUMBER 6

ATOMIC-BOMB RADIATION CATARACT*

CASE REPORT WITH HISTOPATHOLOGIC STUDY

SAMUEL J. KIMURA, M.D.†
San Francisco, California
AND
HIROSHI IKUI, M.D.‡
Fukuoka, Japan

Radiation cataract is a late effect of the atomic bomb that has appeared among the more heavily irradiated survivors in Hiroshima City and Nagasaki City, Japan (Cogan *et al.*[1]). The great majority of these cases were discovered as a result of an ophthalmic survey of the available survivors.

Clinically, these cataracts are similar in appearance to those produced by roentgen rays and radium, and exhibit some fairly definite characteristics. A posterior polar opacity develops which has fairly sharp borders both anteriorly and equatorially. It lies in the subcapsular region and appears as a lacelike disc containing small vacuoles. As the cataract progresses, this disc-shaped opacity may assume a plano-convex form as first described by Rohrschneider[2] (1929). At this stage, the visual acuity is very definitely reduced.

The so-called complicated cataracts differ from radiation cataracts in that they are diffuse, flocculent, and not sharply defined from the rest of the lens.

One patient with a radiation cataract who had been examined periodically for two years elected to have a lens extraction on account of reduced visual acuity although the opacification was not far advanced. Histopathologic study of the sections of this lens together with the clinical study of the patient forms the basis of this report.

CASE REPORT

HISTORY

T. H. (M.F. #400615‖), a 22-year-old student, was first seen by one of us (H. I.) in April, 1948, three years and eight months after the atomic bomb blast over Hiroshima City. At the time of the bombing, the patient was in the forward part of a streetcar behind the motorman, heading toward the hypocenter, which is estimated to have been around 780 meters away. The patient was wearing glasses (myopia) which were blown off by the blast. No flash burns were incurred but he was injured by flying glass fragments. There were many people in the streetcar, but only four other survivors have been found. All have radiation cataracts.

The patient escaped to the nearby mountain area and there, about two hours after the atomic bomb blast, he became nauseated, felt ill, and vomited. He noted severe thirst and diarrhea which lasted some two weeks.

* Sponsored by the Atomic Bomb Casualty Commission, National Research Council, with funds supplied by the United States Atomic Energy Commission and Kyushu University, Department of Ophthalmology.

† University of California School of Medicine, Division of Ophthalmology, and the Atomic Bomb Casualty Commission.

‡ Kyushu University Medical School, Department of Ophthalmology.

‖ Master File Number, Atomic Bomb Casualty Commission.

On about the 14th day, epilation of the scalp hair commenced and within three or four days he became completely bald. After two months, the scalp hair started to grow back slowly.

Petechias were noted on about the 21st day. Fever (40°C.) followed in two or three days and continued for 10 days. During this period the mucous membrane of the mouth began to slough, especially that of the gums. Bleeding from the gums resulted, accompanied by aching of the teeth. During the third month after exposure, the patient developed furunculosis. The first white blood count was taken during the fourth month and it is remembered to have been around 6,000 cells per cubic millimeter.

Failing vision was noted about two years after exposure to the atomic bomb. He consulted an ophthalmologist three or four months later and was then told he had a posterior polar cataract.

The patient was seen by one of us (H. I.) one and one-half years after he first noted visual difficulties. An irregular disc-form opacity was noted beneath the posterior capsule in both eyes. The opacities showed many tiny vacuoles and light was reflected from them "as from the surface of mica." Corrected visual acuity was: O.D., 20/25; O.S., 20/30.

The patient was next examined on October 13, 1949, a little over four years after exposure to the atomic bomb.

Examination

Right eye. The visual acuity was 20/30, corrected. External examination was negative. Ophthalmoscopy showed an irregular disc-shaped opacity of the posterior pole; the fundus appeared normal throughout.

Slitlamp biomicroscopy showed the posterior polar opacity to be lacelike with a few vacuoles interspersed. The opacity appeared almost as though it were part of the posterior capsule rather than in the cortex beneath it. The anterior subcapsular area showed several small vacuoles and a few fine white dots. The remaining portion of the lens was normal.

Left eye. The visual acuity was 20/50, corrected. External examination was negative. Ophthalmoscopy showed a similar posterior polar opacity but it was larger and the peripheral portion was more dense, giving it the appearance of a "doughnut."

Slitlamp biomicroscopy showed a larger and more dense posterior polar opacity than that in the right eye. It appeared as a planoconvex, disc-shaped subcapsular opacity. The anterior and posterior portions seemed granular with occasional large vacuoles, many polychromatic crystals, and forming two surfaces that reflected light brilliantly.

The space between these two surfaces appeared optically empty except for numerous small highly reflective particles. The peripheral border of this disc-shaped opacity was more opaque. As seen in Figure 4, this thickened border gives the doughnutlike appearance when this type of opacity is viewed with an ophthalmoscope.

Months later the lens changes had advanced and on the patient's insistence the left eye was operated. An intracapsular extraction was performed by one of us (H. I.), on December 13, 1949. Under local anesthesia, a conjunctival flap was made, a full iridectomy was performed, the zonules stripped, and the lens delivered by the use of a loop. Two corneoscleral sutures were placed. The postoperative course was uneventful and the corrected visual acuity was 20/20 two months after surgery.

Histopathology of Extracted Lens

The lens was fixed immediately in 10-percent formalin and embedded in celloidin. Sections were made and stained with hematoxylin and eosin.*

* The slides were prepared and stained by the Department of Ophthalmology of Kyushu University Medical School, Japan.

GROSS

The lens measured approximately eight mm. in diameter and two and one-third mm. in thickness. The posterior pole showed a "doughnut" or a ring-shaped opacity of about four mm. in diameter. This ring appeared to be a part of the posterior capsule.

HISTOPATHOLOGY

Meridional sections through the lens in the axial plane were studied.

Lens capsule. The thickness was normal. The middle one-third of the posterior lens capsule was wrinkled, thickened, loose, and separated from the underlying cortex by amorphous debris and empty spaces (fig. 1-A).

The epithelium was composed of a single layer of cells which varied in thickness and in the spacing of the nuclei. There were some areas which were fairly normal and others where the epithelium tapered gradually to a thin strand. In the latter areas the nuclei were elongated, irregular in shape, and occasionally pyknotic. There was no extension of the epithelium beneath the posterior capsule.

The epithelial cells at the equator also were irregular in shape and in distribution. The nuclei of the peripheral lens fibers at the equator were very irregular in shape and sparse in distribution. Many of the lens fibers showed vacuolation.

Lens cortex. There was a clear-cut demarcation between the normal cortex centrally and the peripheral cataractous band. There were no normal lens fibers peripheral to the zone of normal cortex.

Anteriorly, this layer of damaged cortex was thinner than that of the posterior lens. It varied in thickness and the fibers showed some vacuolar degeneration. The lens fibers beneath the anterior capsule were replaced by an amorphous granular material which stained deeply with eosin.

Posteriorly, the cataractous cortex was quite sharply demarcated. Peripherally the zone of cataractous degeneration was thicker and contained more vacuoles (fig. 1-B). Within the amorphous and granular staining material there were strands of normal staining lens fibers (fig. 2-C).

Fig. 1 (Kimura and Ikui). Radiation cataract lens. (A) Amorphous debris and empty spaces between posterior lens capsule and underlying cortex. (B) Peripherally the zone of cataractous degeneration was thicker and contained more vacuoles. (F) The junction between the posterior cataractous cortex and normal cortex anteriorly formed almost a straight line.

At the junction of the outer and the middle third of the posterior surface, this peripheral area of cataractous cortex ended abruptly (fig. 2-D). In the middle third a

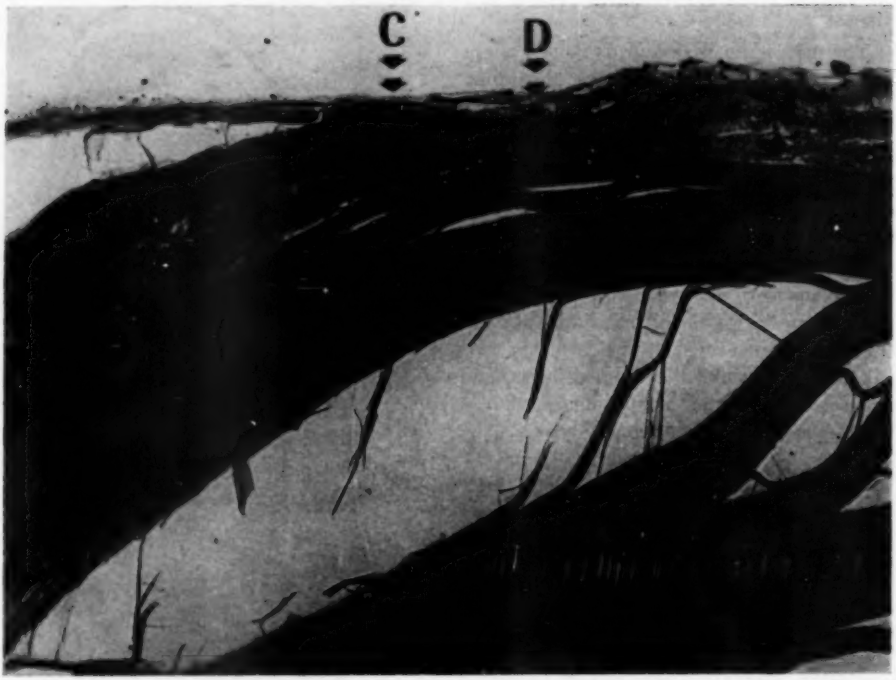

Fig. 2 (Kimura and Ikui). Lens cortex. (C) Strands of normal staining lens fibers. (D) The peripheral area of cataractous cortex ended abruptly.

semicollapsed space was present containing clumps of amorphous debris (fig. 3-E). The junction between this posterior cataractous cortex and normal cortex anteriorly was well defined and formed almost a straight line (fig. 1-F).

The remainder of the cortex and nucleus were normal.

Discussion

The correlation between the clinical findings and the histologic sections of this radiation cataract is interesting.

Figure 4 shows a diagrammatic representation of the findings on ophthalmoscopic and slitlamp examination. This plano-convex opacity, which is seen in more advanced radiation cataracts, is almost entirely confined to the posterior subcapsular area. The plano-surface is formed by the junction between normal lens fibers anteriorly and degenerated lens fibers posteriorly. The convex portion is formed by posterior capsule. The clear area in the center is probably composed of a gelatinous liquefied material derived from the lens fibers containing the small particles which reflect light brilliantly on examination with the biomicroscope.

The microscopic sections of the lens show (fig. 3) the posterior capsule to be wrinkled, thickened, and collapsed. This finding may be the result of liquefaction of the central part of the posterior subcapsular opacity with dehydration during the process of preparing the specimen for microscopic examination. It is probable that the loss of this fluid releases the tension on the posterior capsule causing it to become thicker and wrinkled.

The original injury to the lens probably damages the epithelium. The observation that

Fig. 3 (Kimura and Ikui). Lens cortex. (E) In the middle third there was a semicollapsed space containing clumps of amorphous debris.

there were no normal lens fibers peripheral to the cataract makes it seem likely the lens opacity progresses because the epithelium is irreversibly damaged. The changes in the equatorial lens epithelium and nuclei of the peripheral lens fibers would seem to verify this observation.

Okusawa[3] (1933), after producing experimental radiation cataracts in rabbits, concluded that the lens epithelium was the site of the original injury.

Grzedzielski[4] (1935) reported histopathologic studies of two lenses with radiation cataracts and concluded that the cataract was formed because of an injury to the lens epithelial cells.

Leinfelder[5] (1936) came to the same conclusion, adding that the cataractous changes in the severely irradiated lens may progress, while those which are less intensively irradiated do not. It appears that progression of this type of cataract depends on whether the cells of the lens epithelium are permanently damaged or not.

Tamura *et al.*[6] studied sections of 48 eyeballs from atomic-bomb victims who died of a severe radiation illness. They found six eyes exhibiting vacuoles in the lens fibers of equatorial sections of the lens. In two of these eyes the nuclei of the equatorial lens cells were degenerated and there was evidence of swelling and disintegration of a thin layer of cortex beneath the anterior and posterior capsules. It is possible these were the result of late fixation of the eyes.

The atomic-bomb radiation cataracts were undoubtedly caused by the initial radiation; that is, gamma rays and neutrons. Both are highly capable of causing physiologic damage to the tissues of the body including the lens. Even though the lethal range of neutrons is relatively short, their high biologic effectiveness suggests that they were at least a contributory factor in many of the cases.[7]

Evans[8] (1948) has produced experimental cataracts by means of controlled neutron irradiation. That gamma rays produce cataracts has been known since Chalupecky[9] (1897) first produced them experimentally.

The pathogenesis of radiation cataracts or any other body effects due to radiation is not known. There are many theories proposed to explain the biologic effects due to ionizing radiation. However, the initial effect

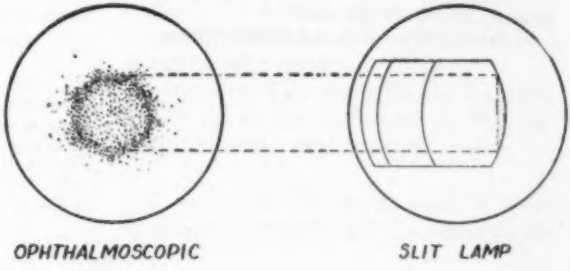

Fig. 4 (Kimura and Ikui). A diagrammatic representation of the findings on ophthalmoscopic and slitlamp examination.

of gamma rays and neutrons must be on the lens epithelial cells.

Generally any body damage by radiation originates in the individual cells and it is the nucleus of the cell which reacts to the irradiation. In the lens the only cells with a nucleus are the lens epithelium and the equatorial lens fibers.

Epithelial cells are generally quite sensitive to irradiation. Also the equatorial lens epithelium is actively producing lens fibers at all times and again such active cells are more sensitive to irradiation.

Thus, it appears that both gamma rays and neutrons from the initial radiation of the atomic burst produced ionization in the lens epithelial cell nucleus. The cataracts are the physiologic result of the initial damage to the lens epithelium.

It is not known why the posterior subcapsular area is affected more than the anterior lens. Clinically, radiation cataracts first appear at the posterior pole. Microscopic examination shows definitely that the posterior subcapsular cortex is involved more than the anterior subcapsular cortex.

It is conceivable that the lens fibers of the posterior pole have a poorer nutrition because of the lack of lens epithelium. It has been shown by Kinsey[10] that there is a greater metabolic transfer through the anterior surface of the lens than the posterior surface.

Summary

This is the first report of a histopathologic study of atomic-bomb radiation cataract. The case was followed periodically for two years. The onset of poor visual acuity occurred two years after exposure to the atomic-bomb burst. An intracapsular cataract extraction was performed on one lens and studies were made.

This lens was particularly interesting for it showed a plano-convex form of posterior polar opacity, first described by Rohrschneider.

Clinically and histopathologically, atomic-bomb radiation cataracts are similar to those produced by roentgen rays and radium.

The Medical Center (22)

The authors express their gratitude to Dr. David G. Cogan and Dr. Michael J. Hogan for their constructive criticisms and help in the preparation of this paper.

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ESOTROPIA*

Incidence, etiology, and results of therapy

Richard G. Scobee, M.D.
St. Louis, Missouri

Esotropia is the most frequently encountered form of heterotropia. In a series of 558 consecutive cases of heterotropia, 456, or 82 percent, were cases of esotropia. If approximately four out of every five patients with heterotropia that consult the ophthalmologist have esotropia, then the therapy of this particular entity is especially important.

The treatment of esotropia by both nonsurgical and surgical means is far from exact. As always, marked variation in modes of therapy is indicative of general dissatisfaction with any single method. At present there is a great deal of empiricism in the therapy of esotropia. This situation is unfortunate because it leads the neophyte in ophthalmology into acting without thinking. The result is that many ophthalmologists are treating a name—esotropia—rather than a condition—the condition responsible for the deviation.

Duane[3] decried this state of affairs over half a century ago when he wrote that ". . . these (motor anomalies) were formerly (and to a great extent still are) classified simply according to the appearance presented, i.e., as inward, outward, upward, or downward deviations. And, to recur to our former illustration, just as dropsy, regardless of whether it was due to renal, cardiac, or hepatic disease, was treated by the same empirical routine, so an inward squint was (and often still is) treated simply as a squint quite without reference to its origin. The results in both cases have often been disappointing. But we should always feel that such a diagnosis (heterotropia) is provisional, and that a really satisfactory diagnosis should express the cause of the deviation as well as its character."

It is unfortunate that, in many instances today, Duane's words are just as applicable as they were at the time he wrote them.

The sample

Patients included in this study came from two sources. They were either from my private practice or from the Washington University Motility Clinic. Their ages ranged from one year to 77 years and the two sexes were about equally represented. All observations on every patient were made by me. One variable—that of differences between examiners—was thus eliminated.

Although the chief goal of the study originally was an analysis of surgical results, nevertheless several items of interest were uncovered and will be reported. The data given in this paper will be largely confined to that from patients with esotropia. Data for patients with exotropia and with hypertropia will be reported in subsequent papers.

The methods

A bald statement of results is of no value unless the methods employed in obtaining those results are known in detail. The routine of examination and treatment used in patients with esotropia may be described in rather full summary as follows:

1. *History.* This was given by a parent, usually the mother, in the case of child patients. All items were recorded in some detail.

2. *Refraction.* All patients under 40 years of age were refracted under atropine cyclo-

* From the Department of Ophthalmology, The Oscar Johnson Institute, Washington University School of Medicine. This study was made under contract with the Office of Naval Research as Project N6onr-202, Task Order I, NR 141-022. Read before the Research Section of the Pan-American Association of Ophthalmology at Miami Beach, March, 1950.

plegia without exception. Atropine ophthalmic ointment was used in each eye three times a day for three days prior to a determination of the refractive error. The 0.5-percent ointment was used in patients under two years of age; 1.0-percent ointment was employed in all patients over the age of two years. In infants and young children, the examination was necessarily limited to retinoscopy; in older patients, a subjective verification for objective findings was sought.

3. *Glasses.* A full correction for both hypermetropia and hypermetropic astigmatism as found under atropine cycloplegia was ordered in every case and nothing was deducted for ciliary tone—a practice of many ophthalmologists. Patients were required to wear their correction for a minimum of one month before returning for an evaluation of their heterotropia.

In young children in whom the refractive error was relatively small (less than two diopters), the parents were instructed to use single daily instillations of atropine ointment for two or three days if the child complained that vision was blurred with the glasses or if he showed any disinclination to wear them, probably because of that fact. In the event that a patient was myopic and had esotropia, the minimum minus correction compatible with visual acuity of 20/20 was prescribed.

4. *Occlusion.* This was instituted at the time of the refraction if suppression amblyopia was present. The occlusion was constant. The elastoplast occluder (Duke Laboratories, Stamford, Connecticut) was found to be most satisfactory.

Occlusion was continued until no additional improvement in visual acuity was noted on two successive visits at monthly intervals. In no patient was occlusion discontinued solely because of lack of improvement in visual acuity from its original level when the patient was first seen. The implication here is that no patients with what has been called congenital amblyopia were present in the entire series and this is correct.

It is true that a few patients could not be occluded because of lack of coöperation on the part of the patient or parents or both. Occlusion was rarely attempted in patients over eight years of age, although it was carried out successfully in a few instances.

5. *Orthoptics.* At the time this study was being conducted, no formal orthoptics were available and so the series is representative of patients who had everything possible in the way of therapy with the single exception of formal orthoptics. This lack of orthoptics was a definite disadvantage to the patients in many instances but was valuable for the study.

Analysis of results reveals what may be accomplished without orthoptics. A subsequent paper will deal with a series of similar size in which orthoptics were available and utilized to the utmost. Comparison of results in the two studies should prove of interest to all concerned with the therapy of heterotropia, particularly with orthoptics.

6. *Preoperative measures.* When visual acuity had improved as much as seemed possible with occlusion, if the patient was not fusing while wearing glasses and if the esotropia was not purely nervous in character, then surgery was performed.

Prior to operation, refraction under atropine cycloplegia was repeated and if any significant change had occurred, new lenses were prescribed and worn for a period of one month before final preoperative measurements were made. A few patients who could not be made to carry out occlusion successfully went to surgery with eccentric fixation in one eye.

A period of at least one month for wearing a full refractive correction was required of all patients before evaluation of their esotropia. This interval was deemed sufficient to allow for the establishment of a new accommodation-convergence ratio in the large majority of patients. In the process of evaluation, the esotropia was measured with first one and then the other eye fixing with

and without glasses. Any difference in the measurements with and without glasses was assumed to represent the accommodative component of the esotropia.

All patients with esotropia were placed into one of three groups, the classification being made on a basis of the effect of glasses on their esotropia. The *purely accommodative* group had their esotropia abolished by the wearing of corrective lenses. The *partly accommodative group* had their esotropia decreased but not abolished by glasses. The *nonaccommodative group* had the same amount of esotropia with and without lenses correcting their ametropia. These groupings were preserved in the analysis of results which is to follow.

7. *Surgery.* This was performed under general anesthesia in every case. I either performed the operation myself or it was performed under my direct supervision and assistance. The surgical technique was as uniform as possible for the entire series and has been described in detail previously.[9]

Ether was used for patients under 12 years of age, while patients older than 12 years were given intravenous sodium pentothal. No serious anesthetic difficulties were encountered in any of the cases in this series.

The position of the eyes under deep general anesthesia was noted for every patient and a forced duction test was then performed.[6] If the forced duction test revealed nothing of significance, the choice of the eye to be attacked surgically was made on the basis of preoperative studies; if the forced duction test gave significant findings, the eye indicated by the test was attacked, irrespective of the preoperative findings.

8. *Operation.* The operations performed may be divided into three classes: (1) Recession of one medial rectus, (2) recession of both medial recti, and (3) recession of the medial rectus and resection of the lateral rectus of the same eye.

It is necessary to mention briefly the points considered in determining the type of surgery to be performed in each case. It might be emphasized that only in patients in whom the goal was solely cosmetic was the decision as to exactly what should be done surgically made before the patient was upon the operating table. Even in these cosmetic cases, findings upon the operating table changed the plan of attack in several instances.

If the near point of convergence was more than 50 mm. from the bridge of the nose, a diagnosis of secondary convergence palsy was made and never more than a single *medial* rectus was touched; occasionally a lateral rectus was resected, in addition to the medial rectus recession in these patients. If one eye was amblyopic and the patient was over 12 years of age, recession of one medial rectus and resection of the lateral rectus of the same eye was almost invariably done. Both secondary convergence palsy and suppression amblyopia are definite contraindications for a bilateral recession of the medial rectus muscles.

Generally speaking, if the esotropia measured less than 25 degrees (50 prism diopters), only one medial rectus was recessed unless other findings, to be mentioned later, indicated a need for an attack on the medial rectus of the opposite eye. If the esotropia was greater than 25 degrees, it was usually necessary to recess both medial recti. When an esotropia was quite variable in amount, both medial recti were never recessed at the same operation.

If an esotropia disappeared completely under deep general anesthesia and the eyes became divergent, usually only one medial rectus was recessed irrespective of the preoperative measurement of the esotropia. If some significant anomaly was found associated with one medial rectus muscle and that muscle was still normally elastic and retractile, even though the esotropia was large in amount, only a single medial rectus was recessed.

In a relatively small esotropia, if the deviation decreased little if at all under deep general anesthesia, frequently both medial

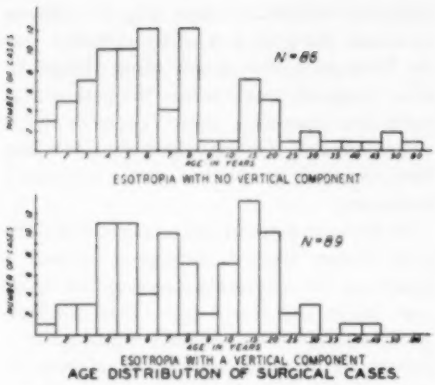

Fig. 1 (Scobee). Age distribution of patients with esotropia who were subjected to surgery; 86 patients had no vertical component with their esotropia and 89 did have a vertical component.

recti were recessed. If anomalies were found but were not deemed particularly significant, often both medial recti were recessed.

If a medial rectus was found to be inelastic and retracted poorly, the medial rectus of the opposite eye was usually recessed as well, even though the esotropia was small in amount.

Recession of the medial rectus was always to the region of the equator[5] (about six mm. behind the original insertion). The figure of six mm. is correct for the adult eye but not for the eye of an infant where the equator is closer to the original insertion than six mm. because the eyeball is smaller.

Resection was always confined to the tendon of the lateral rectus and usually averaged between six and seven mm. Advancement, when performed in combination with resection, was usually carried to a point about two mm. from the limbus.

No patient with esotropia and hypertropia was subjected to an operation for esotropia first if the hypertropia was more than one-half the esotropia in the primary position. In such patients, vertical surgery was performed first and no cases with esotropia of this type are included in the report of surgical results.

Vertical and lateral surgery was not done at the same operation in any instance. The surgical cases were divided into two main groups on the basis of whether or not a vertical component was present and this grouping was preserved in the entire analysis of data.

The age distribution for these two surgical groups of esotropia is shown in Figure 1. The groups are fairly comparable, 86 patients having esotropia without a vertical component while 89 had esotropia with a vertical component.

Compilation of data

Charts and tables summarizing the various points in the analysis have been prepared. It will be noted that the total cases reported in any one figure is never equal to the 558 cases in the whole sample.

The reason for this is the fact that all of the records for every case were not complete in all respects, for one reason or another. In the case history of many patients, all questions could not be answered. There were many patients too young for any accurate determination of visual acuity. All of the patients were not subjected to surgery.

Some patients had surgery but no adequate follow-up could be made; these were included in the history studies but omitted from consideration of surgical results. Ideally, of course, data would be available on every point for every patient but practically this was not possible in the study of a sample this size.

Age of onset

Almost 28 percent of 524 patients with heterotropia had the deviation present at birth. This figure is undoubtedly conservative because it is based upon case histories and it is well known that many parents require a year or more before they make conscious recognition and admission of the presence of heterotropia in their child. The age of onset as usually reported by parents is the age at which they were finally willing to

admit that something was "wrong" with their child's eyes.

Figure 2 shows that the incidence of heterotropia drops steadily with each year of life. The widely prevalent idea that the commonest age for eyes to "cross" is two and one-half to three years is apparently erroneous.

Certain writers in the past have commented upon a difference in the age at which esotropia and exotropia most commonly appear. Exotropia is said to develop most commonly at about the age of five years. Figure 3 is of interest because it shows that both esotropia and exotropia are more commonly present at birth than at any other time, with the incidence of development decreasing with each passing year of life.

Mode and Time of Birth

Although it is often said that prematurity is significantly related to heterotropia, figures for such a contention are hard to find. Accurate information about birth was not available for the entire sample, but in those patients for whom reasonably reliable data were obtained, there were 31 prematures out of 230. Prematurity was judged more on the basis of birth weight than on the statement of the mother about how long her pregnancy lasted. The incidence of heterotropia among premature births in this series is 13.5 percent.

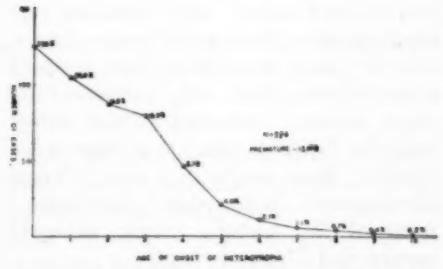

Fig. 2 (Scobee). A study of the age at which heterotropia was first noted in 524 consecutive patients. The highest incidence (27.6 percent) occurred at birth. The incidence of prematurity in this series was 13.5 percent.

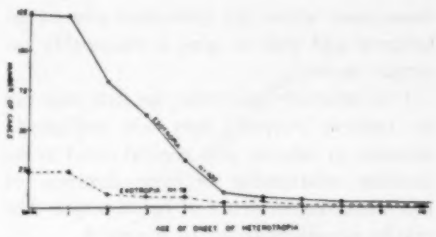

Fig. 3 (Scobee). A series of 498 patients with lateral heterotropia from the standpoint of the age of incidence. They have been divided into esotropia and exotropia and both conditions have their highest incidence at birth or in the first year of life.

Heinmen[4] found an incidence of prematurity in 188 patients with heterotropia of 8.8 percent. About three percent of all infants are born prematurely, while about 1.5 percent of the total population has heterotropia. There is thus a significant relationship between prematurity and heterotropia. Of the 31 patients in this series who had heterotropia and were born prematurely, 28 had esotropia and three had exotropia.

The probable relationship between the use of obstetrical forceps during delivery and the development of heterotropia is mentioned by several writers. Reasonably reliable information about delivery was available for 321 patients in this study; 231 were delivered spontaneously and 90 were delivered with the aid of forceps. Thus 28 percent were delivered with forceps. Of the 90 forceps deliveries, 80 had esotropia, nine had exotropia, and one had hypertropia.

Eight patients in the series were delivered as breech presentations; seven had esotropia and one had exotropia. Five patients were delivered by Cesaerean section; four had esotropia and one had exotropia.

The idea has been expressed that the duration of labor may be significantly related to the development of heterotropia in the child. Data for the duration of labor in this series is not entirely accurate because it came from histories rather than from hospital records. It might be stated, however, that such information was recorded only for

those cases where the informant seemed intelligent and able to give a reasonably accurate answer.

It is believed that, while the data may not be entirely correct, they are sufficiently accurate to indicate any general trend in the possible relationship between duration of labor and the incidence of heterotropia. The results are summarized in Figure 4.

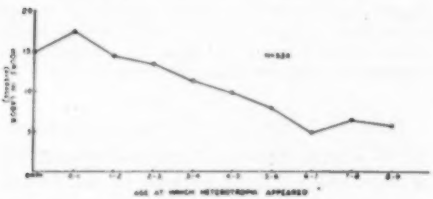

Fig. 4 (Scobee). A series of 524 patients with heterotropia studied from the standpoint of the number of hours the mother was in labor plotted against the age at which the heterotropia developed. It would appear that the shorter the labor, the later in life heterotropia develops, if indeed it develops at all.

The results are of definite interest but of dubious significance. They seem to point to the conclusion that the shorter the labor, the later in life the child will develop heterotropia if indeed it develops heterotropia at all. Stated in another way, the longer the labor, the more likely are the infant's eyes to be either crossed at birth or to cross during the first year of life.

One might possibly use these data as an argument for the greater incidence of trauma to the infant during prolonged labor. It is believed that the data are of more interest than significance and they are presented without further comment or attempt at explanation.

Familial Incidence

The familial incidence of heterotropia is well known. In 275 patients, there was no known heterotropia in the family. In 191 patients, heterotropia was present in the family. This represents an incidence of 41 percent with heterotropia in one or more members of the same family. The nature of the family relationships may perhaps be of interest. There were 43 siblings, 32 aunts, 29 mothers, 25 uncles, 18 fathers, 18 first cousins, nine grandmothers, six great uncles, three grandfathers, three great aunts, three second cousins, one third cousin, and one great grandmother.

Supposed Cause

An examiner can always elicit interesting replies to the query: "What caused your child's eyes to cross?" The variations in the answer to this question make it worth while to list the causes given by the parents for 179 patients. No cause was known for the remainder of the sample:

34 due to "an injury" (not a fall)
22 due to "a fall"
18 due to "whooping cough"
16 due to "measles"
7 due to "fever"
5 due to "convulsions"
5 due to "strep sore throat"
4 due to "the flu"

The causes given for a series of groups each containing two patients were meningitis, sinusitis, German measles, corneal scars, bad colds, pneumonia, scarlet fever, spastic paralysis, "sick for one week," diphtheria, "sore eyes," chicken pox, hyperthyroidism, brain hemorrhage, and "following an operation."

The remaining causes were attributed to but a single patient each: "looking at patterns on wall paper," sinus operation, ruptured appendix, "close work," coeliac disease, infected knee, mastoiditis, "bad temper," photographer's flash bulb, gastrointestinal upset, ricketts, "inherited," "first baby," nephritis, "spasm," injury to a finger, poliomyelitis, "head caught in a door," "began kindergarten," "milk spasm," "hard labor," intestinal flu, typhoid, cough, sickle-cell anemia, and "from mother."

The Accommodative Component

It has been previously stated that the patients with esotropia were classified with

respect to their esotropia as being either purely accommodative, partly accommodative, or nonaccommodative. The purely accommodative group numbered 67 (15 percent); 303 (66 percent) were partly accommodative; and 86 (19 percent) were nonaccommodative.

Adler and Jackson[1] reported a series in which 19 percent were purely accommodative, 21 percent were partly accommodative, 42 percent were nonaccommodative, and 18 percent were paralytic. The few apparently paretic cases in this series will be found in the nonaccommodative group.

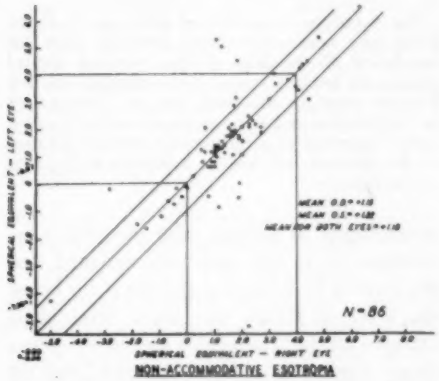

Fig. 5 (Scobee). A study of the spherical equivalent of the refractive error and of anisometropia in 86 patients with nonaccommodative esotropia; 15 percent had anisometropia greater than one diopter. The average refractive error for this group was +1.18 diopters.

There are some interesting differences between the groups just mentioned.

Refractive error

The spherical equivalent of the refractive error for each eye was determined for all patients in the three groups.

In the nonaccommodative group, the average for the right eye was +1.15, for the left eye +1.22, and for both eyes +1.18 diopters.

In the partly accommodative group, the average for the right eye was +3.34, for the left eye +3.27, and both eyes +3.30 diopters.

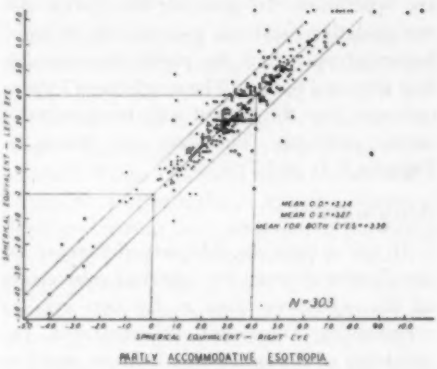

Fig. 6 (Scobee). A study of the spherical equivalent of the refractive error and of anisometropia in 303 patients with partly accommodative esotropia; 13 percent had anisometropia greater than one diopter. The average refractive error for this group was +3.30 diopters.

In the purely accommodative group, the average for the right eye was +3.89, for the left eye +4.13, and for both eyes +4.01 diopters.

The differences between the average or mean refractive error for all three groups

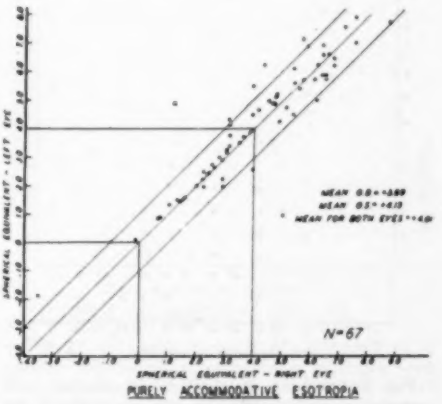

Fig. 7 (Scobee). A study of the spherical equivalent of the refractive error and of anisometropia in 67 patients with purely accommodative esotropia; 12 percent had anisometropia greater than one diopter. The average refractive error for this group was +4.01 diopters.

are significant. In general, the purely accommodative esotropia patient will be more hypermetropic than the partly accommodative one, and both will be much more hypermetropic than the patient with nonaccommodative esotropia. The data are shown in Figures 5, 6, and 7.

Anisometropia

If one selects an arbitrary difference of one diopter between the spherical equivalents of the refractive error in the two eyes as representing significant anisometropia, the incidence of anisometropia is about equal in the three types of esotropia under discussion. Anisometropia of one diopter or more was present in 15 percent of nonaccommodative cases, 13 percent of partly accommodative cases, and 12 percent of purely accommodative cases of esotropia. It would appear that undue emphasis may have been placed upon the etiologic significance of anisometropia in esotropia in the past.

Amblyopia in esotropia

It is now generally accepted that suppression amblyopia develops as a consequence of heterotropia in patients with monocular deviations. It is also generally accepted that the level of visual acuity at birth is far below the level of 20/20, this latter level being attained around the age of five to six years. Many writers have stated the belief that the earlier the onset of heterotropia, the deeper will be the amblyopia. Another idea, also generally accepted, is that amblyopia increases with the duration of heterotropia. The two concepts are not the same but they are similar in some respects. Analysis of the data suggests that neither is true.

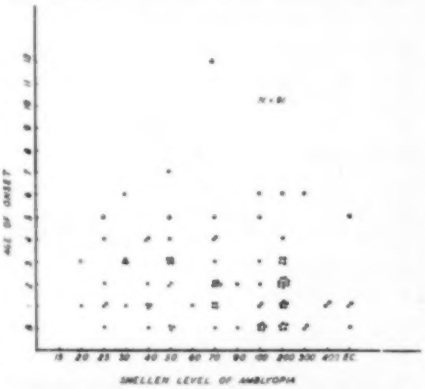

Fig. 8 (Scobee). A study of 91 patients with suppression amblyopia. The age of onset of the esotropia is plotted against the level of amblyopia. The figures along the horizontal line are denominators of Snellen-type notations of visual acuity. There is no clear-cut relationship between the age of onset and the level of amblyopia reached, contrary to popular belief.

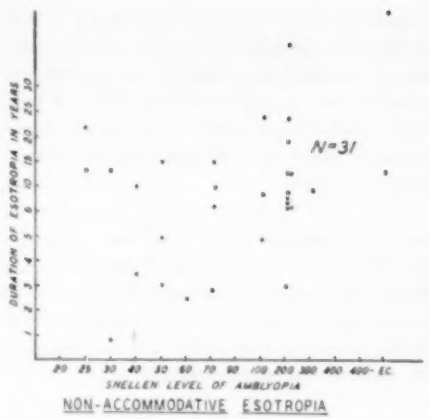

Fig. 9 (Scobee). A study of amblyopia in 31 patients with nonaccommodative esotropia from the standpoint of duration of the esotropia plotted against the level of suppression amblyopia reached. Figures along the horizontal line are denominators of Snellen-type notations of visual acuity. There is some suggestion of a relationship between duration of the deviation and level of amblyopia in this type of esotropia.

There were 91 patients for whom satisfactory visual acuity levels could be obtained. Figure 8 is a plot of the age of onset of esotropia against the level of amblyopia. None of the patients in the cases represented in Figure 8 are younger than five years of age and some are obviously much older.

There is no obvious pattern of the dots representing patients in Figure 8 and thus no marked relationship between the age of onset and the level of amblyopia. There are, for example, more cases with a visual acuity

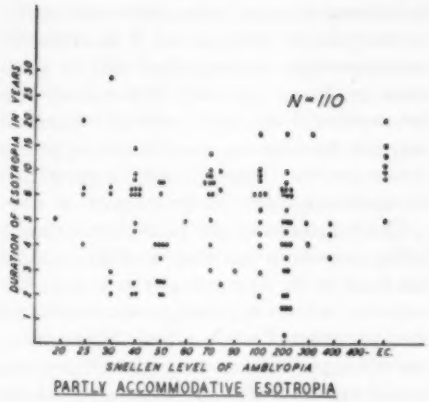

Fig. 10 (Scobee). A study of amblyopia in 110 patients with partly accommodative esotropia from the standpoint of duration of the esotropia plotted against the level of suppression amblyopia reached. Figures along the horizontal line are denominators of Snellen-type notations of visual acuity. There is no significant relationship between duration of esotropia and level of amblyopia in this type of esotropia.

in one eye of 20/200 with an onset after two years of age than before that point.

Figures 9, 10, and 11 are plots of the duration of esotropia in years against the level of amblyopia reached; all three types of esotropia are studied singly. It is only in the nonaccommodative group that there seems to be a suggestion of a significant relationship between these two factors—duration and amblyopia.

In general, it would appear that, when esotropia is either partly accommodative or purely accommodative, the level of amblyopia is *not* significantly related to the duration of the esotropia. It would also appear that the age of onset is not significantly related to the level of amblyopia in esotropia.

There is apparently some variable within the binocular mechanism, some variable as yet unidentified, which determines the level of amblyopia attained in the patient with monocular esotropia. The patient literally seems to be a law unto himself with respect to amblyopia.

Effects of occlusion on amblyopia

Chavasse was one of several to voice the idea that occlusion would return visual acuity in an amblyopic eye to a level which it had previously attained—before the onset of esotropia—but never to a level that it had never attained. Thus, if a child had a visual acuity of 20/90 at 18 months of age and esotropia developed at that time, occlusion of the fixing eye might bring the visual acuity in the deviating eye from, say, 20/300 to 20/90 *but no farther*. The idea seems logical enough on paper. It does not, however, fit the facts.

Figure 12 is a plot of data from the same 91 patients shown in Figure 8. In this graph, the age of onset of esotropia is plotted against the level of amblyopia following occlusion.

In many patients, the level of amblyopia following occlusion will be seen to be zero since normal visual acuity was attained. Only 31 percent of the 91 patients failed to attain a level of visual acuity of 20/40 or better in the previously amblyopic eye.

The graph shows rather clearly that the

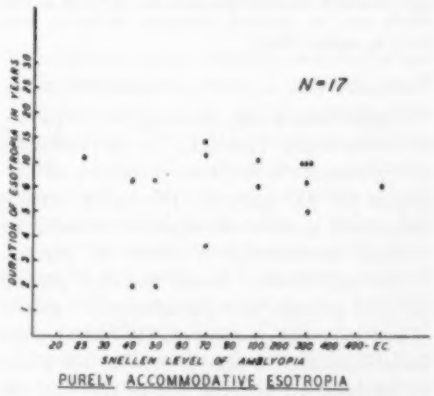

Fig. 11 (Scobee). A study of amblyopia in 17 patients with purely accommodative esotropia from the standpoint of duration of the esotropia plotted against the level of suppression amblyopia reached. Figures along the horizontal line are denominators of Snellen-type notations of visual acuity. There is no significant relationship between duration of esotropia and level of amblyopia in this type of esotropia.

age of onset makes little difference with respect to the level of visual acuity that may be attained by occlusion. The average child patient with esotropia has seven out of 10 chances of attaining visual acuity of 20/40 or better following occlusion irrespective of the age at which his esotropia developed.

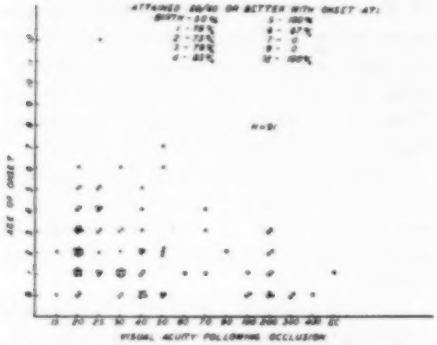

Fig. 12 (Scobee). A study of the same 91 patients as those depicted in Figure 8 but from the standpoint of the age of onset of the esotropia plotted against the level of visual acuity attained following occlusion. Only 31 percent failed to attain vision of 20/40 or better, and it can readily be appreciated that there is no apparent relationship between the age of onset of esotropia and the level of acuity which may be attained following occlusion, contrary to popular belief.

Frequency of a vertical component

Figure 13 is a table showing the frequency of involvement (paresis) of the vertically acting muscles in the three categories of esotropia. Of 457 patients, 195 had a vertical component to their esotropia, an incidence of vertical involvement of about 43 percent. White and Brown[11] found that 36.6 percent of 1,955 patients with disturbances of motility had a vertical component. The basis for the identification of a paretic muscle was a loss of conjugation in some one or more of the six cardinal directions of gaze—in other words, by a study of versions.[10]

The incidence of a vertical component in nonaccommodative esotropia is 49 percent; in partly accommodative, 45 percent; and in purely accommodative, only 21 percent. Generally speaking, vertical involvement is twice as common in nonaccommodative and partly accommodative esotropia as it is in purely accommodative esotropia and this is about what would be expected. One cannot help but wonder if this same vertical component may not have thrown many a case of purely accommodative esotropia into a partly accommodative type with the passage of time.

The frequency of the particular vertically acting muscle or muscles involved is about the same in the three types of esotropia. The superior rectus was found paretic more often than any other. Paresis of both depressors of one eye is probably more common than many would suspect. Paresis of an inferior oblique alone was extremely rare in this series, although paresis of both elevators of one eye was not infrequent.

Results of therapy

Fusion

There may be any one of several criteria employed in judging results in the treatment of esotropia. There is a vast difference between eyes that merely look straight—a good cosmetic result—and eyes that actually are straight with comfortable fusion—a good functional result.

FREQUENCY OF INVOLVEMENT OF VERTICALLY ACTING MUSCLES IN ESOTROPIA	NON-ACCOMMODATIVE (87 CASES)	PARTLY ACCOMMODATIVE (303 CASES)	PURELY ACCOMMODATIVE (67 CASES)	TOTALS
SUPERIOR RECTUS	10	44	6	60
SUPERIOR OBLIQUE	6	25	1	32
INFERIOR RECTUS	3	21	1	25
BOTH DEPRESSORS (SO & IR) - ONE EYE	4	15	1	20
BOTH SUPERIOR OBLIQUES	4	11		15
BOTH INFERIOR RECTI	4	8	1	13
SO ONE EYE, IR OPPOSITE EYE		11		11
BOTH SUPERIOR RECTI	2	4	1	7
BOTH ELEVATORS (SR & IO) - ONE EYE	6			6
SO & IR OF BOTH EYES	2			2
INFERIOR OBLIQUE	1			1
MISCELLANEOUS GROUPINGS	1	1	1	3
N = 457 CASES				
43% HAVE A VERTICAL COMPONENT				
TOTALS	43	139	13	195

Fig. 13 (Scobee). A study of the frequency of involvement of vertically acting muscles in 457 patients with esotropia; 42.7 percent had one or more vertically acting muscles involved and the series is broken down according to the accommodative component. The superior rectus is the muscle most commonly involved in all types.

Data from this study are of interest from two aspects.

In the first place, no formal orthoptics were available so that the results represent the combined effect of all possible forms of nonsurgical and surgical therapy with the single exception of orthoptics.

In the second place, the percentage of partly accommodative cases developing fusion under these circumstances is quite smilar to a previous study of Berens[2] and tends to confirm his data.

Of the 171 patients who had surgery, one group of 86 had no vertical component while the other group of 85 did have a vertical component with their esotropia; 46.5 percent of patients with no vertical component developed fusion, while only 23.6 percent of the patients who had a vertical component in addition to their esotropia attained the same goal. It is doubly difficult to secure fusion without orthoptics in patients with esotropia if there is a vertical component.

None of the purely accommodative cases of esotropia required surgery; 141 partly accommodative cases and 30 nonaccommodative cases were subjected to operation.

Figure 14 summarizes the results in these two groups of cases for each of the three operations on the basis of whether or not a vertical component was present and whether or not fusion was attained.

Considering only the accommodative factor, 30 percent of the nonaccommodative esotropia cases developed fusion; while 41.8 percent of the partly accommodative esotropia cases developed it. The prognosis for fusion is slightly better in partly accommodative esotropia than in nonaccommodative esotropia.

Of the nonaccommodative cases of esotropia, 36.8 percent of those with no vertical component gained fusion; while only 18.1 percent of those with a vertical component attained that goal. The prognosis for fusion is much better in the nonaccommodative case of esotropia when there is no vertical component to the deviation.

Of the partly accommodative esotropia cases, 43.2 percent of those with no vertical component gained fusion. Of similar cases with a vertical component, 40.5 percent gained fusion. In the patient with partly accommodative esotropia, the presence or absence of a vertical component seems to make little difference with respect to whether or not fusion is obtained.

	PARTLY ACCOMMODATIVE ESOTROPIA		NON-ACCOMMODATIVE ESOTROPIA	
OPERATION	NO VERTICAL	VERTICAL	NO VERTICAL	VERTICAL
UNILATERAL RECESSION MR	41 (9)	39 (12)	7 (2)	5 (1)
BILATERAL RECESSION MR	15 (7)	20 (11)	7 (3)	4 (0)
RECESS MR RESECT LR	11 (3)	15 (7)	5 (2)	2 (1)
TOTALS	67 (19)	74 (30)	19 (7)	11 (2)

Figures in parentheses are those that attained fusion in each group.

Fig. 14 (Scobee). The results of surgery on 171 patients with partly or nonaccommodative esotropia studied from the standpoint of the type of operation performed and the presence or absence of a vertical component. Figures in parentheses in each block represent the number attaining fusion in each group. Of 171 patients with esotropia subjected to surgery, 39.7 percent attained fusion without orthoptics.

In the entire group of 171 patients that had surgery, 68 (39.7 percent) attained fusion. If the 67 patients with purely accommodative esotropia, all of whom gained fusion, are added to the 171, a total of 238 cases had proper treatment with an adequate follow-up and 135 (56.7 percent) attained fusion with everything but formal orthoptics. Generally speaking, about one half of all patients with esotropia may be cured, that is, may attain comfortable fusion, without orthoptics.

"Average" surgical results

The fact that one cannot predict the degree of correction to be obtained from an operation on the basis of millimeters of surgery performed has been mentioned pre-

viously.[7,8] In view of the analysis of results reported in subsequent paragraphs, a valuable object lesson may be gained by proceeding to a calculation of the "average" degree of correction obtained for each of the three operative procedures employed.

It is to be reëmphasized that the technique for each of the three different operations was as nearly identical as possible for every patient in each of the three groups.

In other words, the same number of millimeters of surgery was performed in each recession of one medial rectus, in each bilateral recession of the media recti, and in each recession combined with a resection with the exception of a few cases in which some advancement was combined with resection.

Group I. Esotropia without a vertical component

Recession of one medial rectus—15.3-degree average.

Recession of both medial recti—23.3-degree average.

Recess-resect—21.7-degree average.

Group II. Esotropia with a vertical component

Recession of one medial rectus—12.8-degree average.

Recession of both medial recti—26.6-degree average.

Recess-resect—24.3-degree average.

These data are average figures for degrees of correction obtained from the operation employed and not for the millimeters of surgery performed. The amount of surgery was the same for each operation. In order for the reader to realize just how deceptive such average figures may be when applied to specific cases, reference should again be made to the data just listed after reading the subsequent section on surgical results.

Surgical results

A scatter diagram type of chart has been employed to demonstrate the results of surgery in the patients under consideration. Such a diagram has definite advantages because relationships between two variables, if present to any significant degree, are almost immediately apparent upon simple inspection. In the diagrams, the original deviation measured in degrees (*not* in prism diopters) is plotted along the abscissa; the degree of surgical correction obtained is plotted in degrees on the ordinate. Separate diagrams have been plotted for each of the three operations with the cases grouped according to whether or not a vertical component was present. The nonaccommodative and partly accommodative cases are differentiated in the symbols used for them on the diagrams.

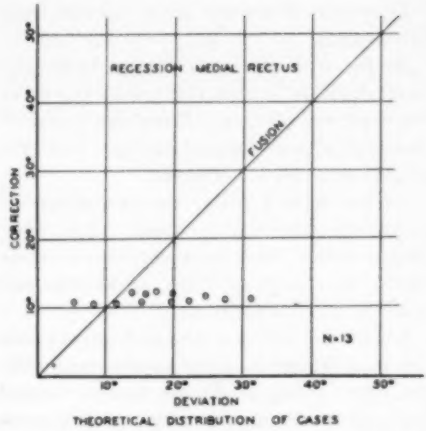

Fig. 15 (Scobee). Theoretical distribution of surgical results in 13 patients with esotropia. The distribution would be expected to resemble this if there is a direct relationship between millimeters of surgery performed and degrees of correction attained. Assuming two degrees (four diopters) of correction per millimeter of surgery, each of these 13 imaginary patients had a six-mm. recession of one medial rectus.

Figure 15 is a plot of 13 imaginary cases for purposes of illustration. If there were any relationship between the number of millimeters of surgery performed and the number of degrees of correction obtained, then the same operation should result in the same correction in every case.

If, for example, a six-mm. recession of

one medial rectus gives about two degrees (or four prism diopters) of correction per millimeter, then every case with a six-mm. recession should have about 12 degrees of correction. When these imaginary cases are plotted on a scatter diagram, the cases should fall more or less in a straight line *parallel* to the abscissa, as shown in Figure 15. The correction obtained should be about the same for each case, irrespective of the amount of esotropia present preoperatively.

If, on the other hand, there is absolutely

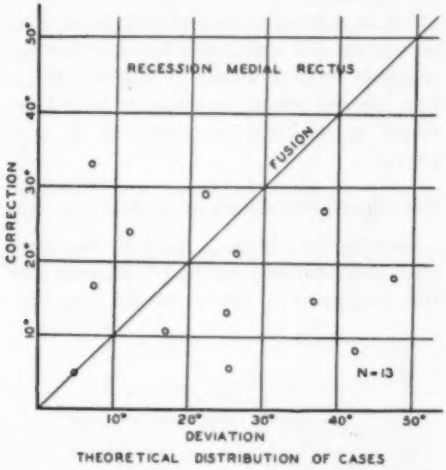

Fig. 16 (Scobee). Theoretical distribution of surgical results in 13 patients with esotropia. If there is absolutely no relationship between millimeters of surgery performed and degrees of correction attained, then the results would look something like this for 13 imaginary patients, each of whom had a six-mm. recession of one medial rectus muscle.

no relationship between the degrees of correction obtained from a fixed number of millimeters of surgery and the preoperative amount of esotropia, then the cases should be scattered all over the chart as in Figure 16.

Finally, if there is some relationship—and indeed there must be one of some sort if results are to be as satisfactory as they are in many instances—it will be brought out by the distribution of dots, each representing one case, in Figures 17 through 22.

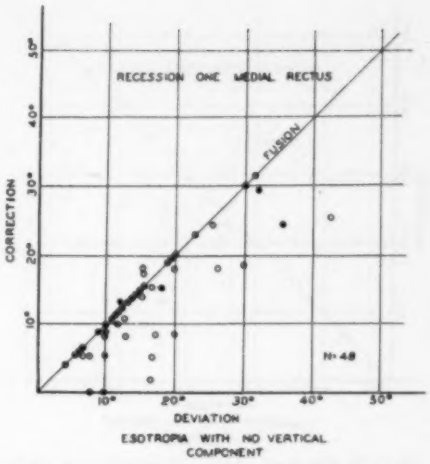

Fig. 17 (Scobee). Actual distribution of 48 patients who had esotropia with no vertical component and had a six-mm. recession of one medial rectus muscle. Solid dots represent cases of nonaccommodative esotropia; the hollow dots are cases of partly accommodative esotropia.

If a diagonal is drawn on each diagram, it might be called the line of Perfect Cor-

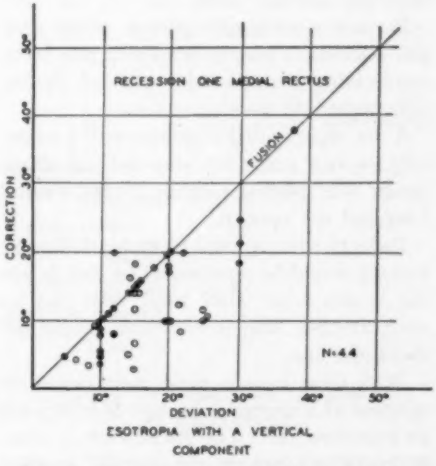

Fig. 18 (Scobee). Actual distribution of 44 patients who had esotropia with a vertical component and had a six-mm. recession of one medial rectus muscle. Solid dots represent cases of nonaccommodative esotropia; the hollow dots are cases of partly accommodative esotropia.

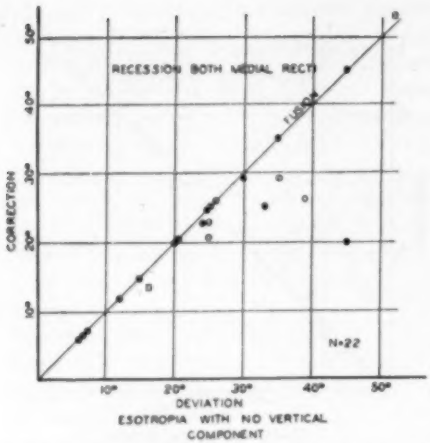

Fig. 19 (Scobee). Actual distribution of 22 patients who had esotropia with no vertical component and had a six-mm. recession of both medial rectus muscles. Solid dots represent cases of nonaccommodative esotropia; the hollow dots are cases of partly accommodative esotropia.

rection or Fusion Line. If a patient has 25 degrees of esotropia and the surgical result is 25 degrees of correction, then the visual axes are perfectly aligned and the case is a surgically perfect result.

Because a surgically perfect result may still not attain fusion, however, only dots representing patients who attained fusion were plotted on the Fusion Line.

A dot representing a patient with a surgically perfect result but who did not attain fusion was plotted tangent to the Fusion Line and not upon it.

Patients with residual esotropia following surgery would be represented by dots below the Fusion Line while those who had an overcorrection, that is, exotropia, would fall above the line.

With these facts in mind, mere casual inspection of Figures 17 through 22 brings out an important fact: The distribution of cases in every instance is significantly grouped about the Fusion Line. This may be surprising to some because it can mean only one thing. The same operation was performed on every case represented in any one of the six diagrams. The deviations were quite different. The results of the same operation were also different. The diagrams show a strong and significant relationship between the deviation originally present and the correction obtained—and yet the same operation was employed in each group.

A general conclusion is easily drawn. On the average, if two patients with esotropia, one having 15 degrees and the other 30 degrees of deviation, are subjected to the same operation, the first will have about 15 degrees of correction while the second will have about 30 degrees of correction. The results, of course, will not always be exact but the diagrams reveal a definite trend in that direction. Similar results have already been published in the surgical correction of exophoria.[7]

Frequency of Anatomic Anomalies

Careful records were made in the operating room for each of the 171 patients who had surgery with respect to the anomalies

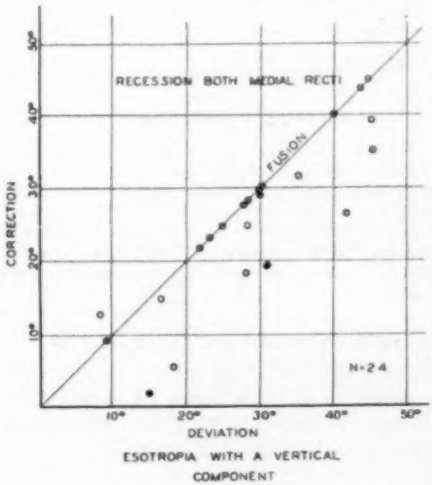

Fig. 20 (Scobee). Actual distribution of 24 patients who had esotropia with a vertical component and had a six-mm. recession of both medial rectus muscles. Solid dots represent cases of nonaccommodative esotropia; the hollow dots are cases of partly accommodative esotropia.

encountered. Some patients had no anomalies while others had several and thus the total number of anomalies is greater than the total number of patients in the series. Figure 23 summarizes the findings.

Anomalies believed significant were encountered in 88 patients out of 171, an incidence of anomalies in esotropia of 51.4 percent. This finding necessitates a revision of a previously published estimate[6] of 90 per-

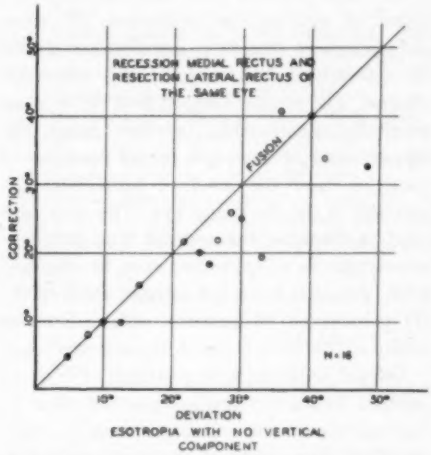

Fig. 21 (Scobee). Actual distribution of 16 patients who had esotropia with no vertical component and had a six-mm. recession of the medial rectus and a seven-mm. resection of the lateral rectus of the same eye. Solid dots represent cases of nonaccommodative esotropia; the hollow dots are cases of partly accommodative esotropia.

cent for a much smaller series. Certainly the figure for the larger group is the more reliable. A description of each of the anomalies listed in Figure 23 may be found in the same paper.[6]

Anomalies were present in 27 of the 30 patients with nonaccommodative esotropia, an incidence of 90 percent. They were present in 61 of 141 patients with partly accommodative esotropia, an incidence of 43.1 percent.

These data lend added support to the contention that the nonaccommodative cases of esotropia are largely mechanical and are

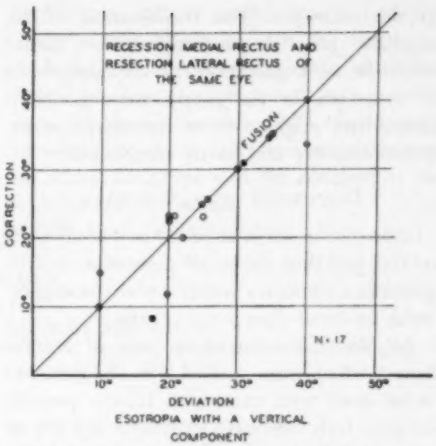

Fig. 22 (Scobee). Actual distribution of 17 patients who had esotropia with a vertical component and had a six-mm. recession of the medial rectus and a seven-mm. resection of the lateral rectus of the same eye. Solid dots represent cases of nonaccommodative esotropia; the hollow dots are cases of partly accommodative esotropia.

a direct result, for the most part, of anatomic anomalies.

In the partly accommodative cases, anomalies are present about half of the time, are not so significant, and probably play more of a predisposing than a causative role

	PARTLY ACCOMMODATIVE (61)	NON-ACCOMMODATIVE (27)
FOOTPLATES	46	20
THICKENED CHECK LIGAMENTS	35	13
INELASTIC MUSCLE	34	19
THICKENED INTERMUSCULAR MEMBRANE	30	18
POSTERIOR CHECK LIGAMENTS	21	13
ABNORMAL INSERTIONS	9	7
FUSED CHECK LIGAMENTS	5	4

INCIDENCE OF ANATOMIC ANOMALIES IN ESOTROPIA

Fig. 23 (Scobee). The frequency of various types of anatomic anomalies in partly and nonaccommodative esotropia; 88 of 171 patients had anomalies believed to be significant—an incidence of 51.4 percent. Anomalies were present in 90 percent of the nonaccommodative cases of esotropia and in 43 percent of the partly accommodative cases.

in the esotropia. The combination of an anomaly plus an accommodative factor might be an explanation for the appearance of esotropia in the partly accommodative cases; they might thus be considered partly accommodative and partly mechanical.

Discussion and Summary

Little discussion is required in a study such as this and thus the usual discussion will be given in a summary which is perhaps slightly more in detail than is customary.

Of the 558 consecutive cases of heterotropia which were studied, 456 (82 percent) were cases with esotropia. It was possible to give fully adequate treatment and get an accurate follow-up in 238 patients. All forms of therapy except formal orthoptics were given and 56.7 percent attained fusion.

A higher incidence of esotropia was found at birth (28 percent) than at any other age thereafter.

Of patients with esotropia whose birth history could be obtained, 13.5 percent were born prematurely (31 prematures out of 230). The incidence of premature births is about three percent for the general population. Twenty-eight percent of patients with esotropia in whom birth data were available (90 out of 321) were delivered with obstetrical forceps.

Forty-one percent of patients with esotropia had others in the family with the same condition; the relative thus affected most commonly was a sibling.

The most common causes of esotropia, according to the layman, are injuries, falls, whooping cough, measles, and "fever" in that order.

Of 456 patients with esotropia, 86 (19 percent) were nonaccommodative; 303 (66 percent) were partly accommodative; and 67 (15 percent) were purely accommodative in character.

The average spherical equivalent of the refractive error in all three types of esotropia was hypermetropic but significantly different in amount. The average for the nonaccommodative group was +1.18 diopters, for the partly accommodative group +3.30 diopters, and for the purely accommodative group +4.01 diopters.

The incidence of anisometropia greater than one diopter was about the same in all three groups: 15 percent in the nonaccommodative, 13 percent in the partly accommodative, and 12 percent in the purely accommodative cases.

Of those patients who were occluded because of suppression amblyopia, 91 were old enough so that their visual acuity could be ascertained both before and after occlusion. The results suggest that there is no particular relationship between either the age of onset of esotropia or the duration of esotropia and the level of amblyopia developed in the deviating eye. The data also tend to disprove the concept that little improvement in visual acuity may be obtained with occlusion in an eye crossed from birth; 69 percent of 91 patients obtained visual acuity of 20/40 or better following occlusion.

Of 457 patients with esotropia, 195 or 43 percent had a vertical component—that is, had paresis of one or more vertically acting muscles; 49 percent of the nonaccommodative group, 45 percent of the partly accommodative group, and 21 percent of the purely accommodative group had a vertical component. The superior rectus was more frequently paretic than any other vertically acting muscle.

Of 171 patients subjected to surgery, 46.5 percent of those who had no vertical component attained fusion, while only 23.6 percent of those who had a vertical component reached the same goal. The presence or absence of a vertical component seemed to make little difference in the partly accommodative group with respect to the postoperative attainment of fusion; in the nonaccommodative group, on the other hand, 36.8 percent without a vertical component attained fusion, while only 18.1 percent of those with a vertical component did so.

The amount of surgical correction ob-

tained in a patient with esotropia is usually directly proportional to the deviation present before surgery and is not particularly related to the amount of surgery performed as measured in millimeters.

Significant anatomic anomalies were found associated with the oculorotary muscles in 88 cases (51.4 percent) of patients with esotropia; 90 percent of the nonaccommodative group had anomalies which probably were largely responsible for the esotropia; 43.1 percent of the partly accommodative cases had anomalies which may have resulted in a predisposition toward the development of esotropia—a predisposition which became an actual deviation with the addition of the accommodative element.

640 South Kingshighway (10).

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PEARL CYSTS OF THE IRIS

OLGA SITCHEVSKA, M.D., AND BRITTAIN F. PAYNE, M.D.
New York

Implantation cysts of the iris usually develop as a result of perforating injuries of the eyeball or of intraocular operations. Traumatic cysts are clinically divided into two distinct types—serous and pearl cysts. Serous cysts are transparent, contain some turbid fluid, and are called epithelial invasion cysts of the anterior chamber. They often form in a wall of conjunctiva covered with epithelium. Pearl cysts are usually associated with an injury of the eye in which cilia are carried into the anterior chamber. The epithelial cells of the hair follicle begin to proliferate a few months or a few years following the injury and form a cyst.

The distinguishing features of pearl cysts are their opacity and pearly luster. The cysts are fairly firm in consistency, round or oval in shape; they are usually lodged at the anterior surface of the iris, sometimes connected with it by a vessel or a bundle of fibers. The histologic examination shows that the wall of a pearl cyst is composed of stratified or cuboidal epithelium, sometimes closely resembling that of the cornea or conjunctiva. The lumen of the cyst forms as a result of degeneration of the centrally located cells which lose their structure; with disappearance of nuclei and with deposition of globules of fat or cholesterol crystals.

Pearl cysts occur infrequently. Only 18 cases were collected by DeSalle[1] up to 1904. In 1921, Wagenman[2] reported on 63 references of cilia in the anterior chamber, some associated with epithelial or pearl-cyst formation. From the review, by no means exhaustive, of the recent literature, we collected 26 additional cases of pearl cysts of the iris following implantation of cilia into the anterior chamber.

Pearl cysts may appear a few months or a few years after the initial injury of the

eye. Villard and Dejean[3] reported a pearl cyst appearing 14 years following a perforating injury of the eye, and Horay[4] of one which developed in 33 years and one in 37 years.

Etiology

Trauma is the only etiologic factor in the formation of pearl cysts. These implantation cysts frequently develop because of penetration of cilia into the anterior chamber. The epithelial cells of their root sheath or follicle may be implanted near or at the iris, then begin to proliferate and give rise to a cyst. Wurderman[5] states that he had seen a dozen of cases in which cysts formed after penetration of cilia into the interior of the eye.

Rothmund,[6] in 1872, was the first to advance the hypothesis of development of cysts of the iris through implantation of particles of skin, conjunctiva, or cornea into the anterior chamber. This theory led to a number of experimental studies.

Goldzieher,[7] in 1874, in his experimental work introduced into the anterior chamber pieces of conjunctiva, nasal mucosa, cornea, and peripheral nerve tissue. He suceeded in producing a cyst of the iris from the implanted nasal mucosa.

Schweninger[8] implanted hairs into the anterior chamber. In most of his experimental animals the hair root united with the iris, frequently with proliferation of the hair-follicle cells.

Masse,[9] in 1881, introduced into the anterior chamber various tissues—muscle, conjunctiva, corneal epithelium. All tissues became absorbed with the exception of the epithelium which proliferated and produced a pearl cyst analogous to a pearl cyst of the human iris. Masse[10] believed that the aqueous is a favorable medium for epithelial growth.

Collins[11] was the first to demonstrate, in 1893, the presence of an epithelial lining in the anterior chamber of an eye operated on for extraction of cataract.

Hosch[12] implanted cilia into the eyes of 13 rabbits but, in these experiments, epithelial cells were never found in the iris. However, in three eyes in which he also implanted skin tissue, cysts of the iris formed. He concluded that the cyst formation can only be obtained if particles of skin are implanted with the cilia.

The more recent experiments were done by Corrado[13] and Perera.[14] Corrado, in 1931, introduced various tissues into rabbits' eyes —conjunctival and corneal flaps, injured lens matter. He found that the mere introduction of epithelial tissue into the anterior chamber was not sufficient to assure its proliferation. Only when the corneal wound remained open for a long time because of delayed healing was it possible for the corneal epithelium to proliferate in the anterior chamber.

Perera, in 1937, introduced a flap of corneal tissue into the anterior chamber of rabbits. The corneal epithelium, which proliferated rapidly after the operation, gradually became degenerated and disappeared and no epithelization of the anterior chamber of normal rabbits was produced.

Since not all eyes which contain cilia in the anterior chamber develop pearl cysts, it cannot be easily explained why in some cases these cysts do form. Dellaporta,[15] in his comprehensive article, suggests a hypothesis that "by using certain imagination the presence of a cilium in the anterior chamber may play the role of a positive catalyzer in a biochemical or hormonal sense."

Why do pearl cysts develop in some cases in several months, in others, several years, after the penetration of cilia into the anterior chamber?

Dellaporta[15] believes that this delay might be due to a sudden change of the medium which slows down the growth of epithelial cells, the aqueous being an unfavorable medium for their growth. On the other hand, Bonnet and Paufique[16] expressed an opinion that cilia in the anterior chamber do not produce pearl cysts but only stimulate the growth of the cyst from the introduced epithelium by their presence ("acte de presence").

Since pearl cysts have been observed in a large number of children and young people after perforating injuries with implantation of cilia, Silva[17] presumes that the cilia of only young subjects have germinal cells attached to their roots and when these cells get in contact with the iris they begin to proliferate. At first they may remain intact for a long time, but gradually, when a mild inflammatory process develops in the iris, the epithelium begins to proliferate and the changed iris tissue, including the iris pigment layer, forms the wall of the cyst.

Differential diagnosis

The diagnosis of pearl cysts is based on the history of an injury, recent or old. In the differential diagnosis of iris cysts the following conditions should be considered —malignant and benign cysts of the iris, congenital cysts, gummas, tubercles of the iris, implantation cysts (invasion-serous and pearl cysts).

The most important consideration must be given to malignant neoplasms of the iris; however, the growth of the latter is more rapid and the color is dark. The slitlamp examination may show transparency of the cyst even when diascleral illumination would indicate a solid tumor.

Duke-Elder[18] states that, if a neoplasm is still suspected, a diagnostic puncture should be performed and, if malignant cells are found, the eye should be removed.

Leukosarcomas of the iris are rare, they are heavily vascularized and whitish in color. Benign tumors of the iris (angiomas, melanomas, nevi) are rare and are distinguished by their shape and mode of evolution. Congenital cysts appear at birth or in early infancy, they are of grayish color and develop very slowly. Gummas usually are bilateral, their color is yellowish and they are situated near the pupillary border; they are not transparent, the blood Wassermann reaction is positive, and they respond to specific treatment. Tubercles are located over the entire surface of the iris in the shape of multiple granules; they are roundish and suppurate rapidly.

Epithelial-invasion cysts are transparent and are more frequently encountered than pearl cysts. Their formation follows an extraction of cataract or a penetrating injury of the eye. The wall of the cyst is thin and it usually contains turbid fluid which is the reason for their name of "serous" cysts.

Pearl or epidermoid cysts contain no cavity filled with fluid; they are opaque, round or oval in shape. Frequently they are of a pearly luster, bluish or yellowish in tint, and, for this reason, they are called "pearl" cysts which is correct only morphologically (Berliner[19]).

Under the microscope, the walls of the cyst consist of concentric overlapping layers of epithelium arranged like an onion bulb. Some of the epithelial cells become keratinized. This stratified cover gives the pearl cysts their resistance and firmness. One or more cilium are often seen with the slitlamp either in the cyst or in the iris. A careful history of trauma, even of a trivial one, should be taken, and a detailed search for a scar, the site of an old wound, should be included in the examination.

Clinical course

Three periods are usually observed in the course of the development of a pearl cyst, according to Bonnet and Paufique.[20] The first, quiet stage may last a long time, if the cyst is slow in progressing and is well tolerated by the eye.

The second stage is characterized by pain, ciliary injection, photophobia, lacrimation. It is the period of iridocyclitis; precipitates appear on the Descemet's membrane; synechias may form, and occlusion and seclusion of the pupil follow (Lagrange[21]), with great impairment of vision. It was in this period when cases of sympathetic ophthalmia were reported.

The third period is the one of increased intraocular pressure. The cyst is large, sometimes filling the whole anterior chamber.

The blocking of the angle of the anterior chamber by the cyst leads to intractable secondary glaucoma, with enucleation being the ultimate fate of the eye.

Prognosis

Because of the intraocular location and progressive growth, the prognosis of epidermoidal cysts is grave for the visual organ. If left alone, the cysts eventually may fill the anterior chamber, with consecutive secondary glaucoma, which does not respond to any form of treatment (Custodis[22]) and which usually leads to the loss of the eye.

Perera[23] stated that, in 1938, four eyes were enucleated at the Eye Institute because of absolute glaucoma caused by cysts of the anterior chamber which followed perforating injuries of the eye. Whitehead[24] described a case of an implantation cyst of the iris which caused secondary glaucoma and blindness, requiring enucleation.

Fieta[25] reported a case of a 15-year-old girl whose right eye was injured with a piece of wire; 16 months later a pearl cyst developed in that eye. An operation was refused at first, but when the eye developed an iridocyclitis, the cyst was removed. A few days later a sympathetic ophthalmia developed in the uninjured eye. The right eye was enucleated and the sympathizing eye quieted down.

Wagenman[26] cited two cases of sympathetic ophthalmia caused by pearl cysts following the implantation of cilia. Gunier[27] and von Graefe[28] each encountered a case of sympathetic inflammation of the eye caused by a pearl cyst of the iris following an eyelash implantation into the interior of the eye.

In Field's[29] case an implantation cyst developed three months following a penetrating injury of the left eye; shortly afterward the right eye became inflamed and a diagnosis of sympathetic inflammation was established. Though these complications are exceedingly rare, they should be borne in mind. The early removal of pearl cysts may prevent serious complications and loss of the eyeball.

Treatment of traumatic cysts

The review of the literature on iris cysts shows that they do not disappear spontaneously. Various methods of treatment have been used.

Schoeler[30] and Alger[31] advised aspiration of the cyst and injection of its cavity with a weak solution of iodine. Schoeler obtained good results in two cases.

Wright[32] of Madras aspirated a cyst and injected it with a one-percent solution of phenol with one syringe; the second syringe containing normal saline was used for irrigation of the cyst in order to check the destructive action of the phenol. Six weeks later the slitlamp showed complete collapse of the cyst with formation of fine posterior synechia.

Axenfeld,[33] Custodis,[22] Perera,[14] Horay,[4] Jendralski,[34] Pincus,[35] and others used radiation therapy with good results in implantation cysts. Fields[29] combined X-ray therapy and surgical interference; after shrinking the implantation cyst to about half its size with roentgen therapy, he removed surgically the remainder of the cyst.

All these methods are not safe as they may lead to a severe inflammation of the eye. Cataract formation as a result of X-ray therapy should always be kept in mind. Of the medical treatment only electrolysis is a safe method.

Thilliez[36] used electrolysis for the destruction of a cyst which filled three quarters of the anterior chamber and in which surgical removal seemed difficult. The cyst collapsed, but recurred in six months; a second electrolysis treatment resulted in a cure.

Safar[37] in 1935 was the first to use electrocoagulation with high frequency current (similar to the one used in retinal detachment operations) in the treatment of a pearl cyst which developed six years following a cataract extraction operation. A small incision of the cornea was made, then the diathermy needle was introduced and the wall of the cyst was coagulated.

The consensus is that the method of choice in solid cysts is surgery; that is, that the cyst should be excised in toto in an iridectomy through a large corneal section. The operative interference should be undertaken early, when the cyst is small and is still well tolerated by the eye.

The surgical method was used by Dan,[30] Bonnet and Paufique,[16] Villard and Dejean,[3] Strader,[39] Moore,[40] Teulieres and Beauvient,[41] and Magitot[42] with good results. The surgical intervention is frequently difficult because of the limited space between the cornea and the cyst, so that the cyst is often opened and has to be removed piece by piece. Goldberg[43] reported a case of a pearl cyst in which he made two unsuccessful attempts for its removal (final outcome not reported).

The removal of the cyst does not preclude its recurrence. Such a case was reported by Moore.[40] A young surgeon was hit with a ball in his eye glasses which broke and injured his eye. Ten months later a pearl cyst of the iris developed; it was removed together with the cilium embedded in it. However, five months later, a similar cyst was noticed at the coloboma at the root of the iris. It was removed surgically again and the eye had been quiet during eight years of follow-up. A recurrence of a pearl cyst was also observed by Bonnet, Paufique and Bussy.[44]

Report of a case

A case of two cilia in the anterior chamber following a perforating injury of the eye with a piece of wire and their successful removal has been reported by us.[45] The cilia were removed five weeks after the injury when a mild iridocyclitis developed. The cilia were removed by forceps through a corneal incision at the limbus at the 9-o'clock position and the recovery was apparently uneventful. The vision in the injured eye was 20/50, unimproved by glasses.

The postoperative follow-up for five months disclosed no change in the condition of the eye. The patient was requested to visit the office once a month, but she appeared three months later instead, in November, 1948 (eight months after removal of the cilia), complaining of slight photophobia.

The eye was quiet; there was no flare in the aqueous; the intraocular pressure was 14 mm. Hg (Schiøtz). The slitlamp examination, however, revealed the presence of a small, dark bulge of the iris at the 5- to 6-o'clock position at the angle of the anterior chamber, its size being that of a pin head.

Within the next five months, the elevated area covered with pigment increased slowly in size and by the end of March, 1949, it reached the size of a small pea and measured 3.0 by 5.0 mm. It was of ovoid, slightly irregular shape (fig. 1). The iris was stretched and atrophic over the cyst; the center

Fig. 1 (Sitchevska and Payne). Pearl cyst of the iris. (Drawing made under the slitlamp.)

of the cyst was of a whitish yellow or rather muddy color. It was opaque.

In front, the tumor was in apposition to the posterior surface of the cornea. The pupillary margin was free. There was moderate ciliary injection; the aqueous was clear; the intraocular pressure was normal, and the vision was still 20/50. There was a coloboma of the iris at the 9-o'clock position, the site of the removal of the cilia; a small scar of the cornea was present four mm. below the limbus at the 12-o'clock position, the site of the initial perforating injury.

A few punctate pigmented opacities in the deep layers of the cornea were seen at the 5-o'clock position above the limbus. The lens capsule was opaque near the 7-o'clock position. In view of the presence of ciliary injection and of some pain and photophobia, it was felt that operative interference was indicated. The patient was admitted to the New York Eye and Ear Infirmary.

On April 12, 1949 (just one year after removal of the cilia), an operation for removal of the iris cyst was performed under local anesthesia. A large conjunctival flap was made at the lower half of the eyeball 5.0 to 6.0 mm. below the limbus; it was undermined and turned up. A keratome incision was made temporally to the location of the cyst and the incision was enlarged by scissors beyond the cyst on the nasal side.

Fig. 2 (Sitchevska and Payne). Eye after removal of the cyst. (Drawing made under the slit-lamp.)

An iris forceps was used to enter the anterior chamber, the pupillary margin of the iris was grasped by the forceps, the iris pulled out with the cyst and cut off at the base. While the iris was being pulled out, the cyst was ruptured and was removed in fragments. The iris pillars were reposited with a spatula.

Silk sutures were applied to the conjunctival flap; drops of a one-percent solution of atropine, sulfathiazole ointment, and a bilateral bandage were applied. The postoperative course was uneventful; the patient was discharged from the hospital in 10 days.

The eye has been quiet to date (one year after removal of the cyst). The vision in this eye is 20/50, the same as it was before the removal of the cyst. The lens opacities are more noticeable on the nasal side because of the large coloboma of the iris. The fundus is seen and appears to be negative (fig. 2).

The following pathologic report of the specimen was submitted by Dr. B. A. Roberts, assistant pathologist, New York Eye and Ear Infirmary:

"A section of iris is submitted for study. The stroma of the iris contains a great quantity of deeply pigmented chromatophores. This is apparently a negroid iris. The sphincter-iridis is intact and has been cut obliquely. The posterior pigment layer has lost its normal festooned appearance and is somewhat fragmented. Contiguous with the anterior limiting layer of the iris is a layer of stratified squamous epithelium, in some areas the epithelium has 10 to 12 layers, in others it is thinned from one to two layers. On one edge of the section studied there is a collection of cellular detritus (figs. 3 and 4).

"Diagnosis: Implantation, or pearl, cyst of the iris."

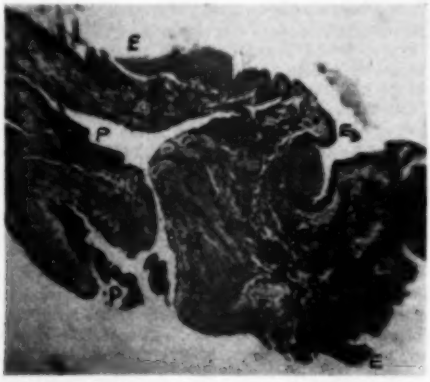

Fig. 3 (Sitchevska and Payne). Wall of the pearl cyst. (E) Squamous epithelium. (P) Pigment layer of the iris. (I) Iris. (Low-power photomicrograph, ×12.)

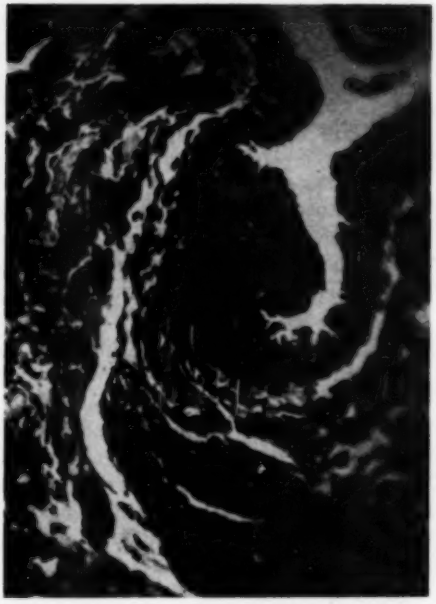

Fig. 4 (Sitchevska and Payne). Higher magnification (×40) of Figure 3, showing the squamous character of the epithelium.

Comment

The interest of this case lies in the development of a pearl cyst of the iris despite the removal of two cilia eight months previously. The most feasible explanation is that

some epidermoid particles from the root sheath of a cilium were introduced simultaneously into the anterior chamber at the time of the initial perforating injury of the eye. These epithelial cells lodged at the angle of the anterior chamber, began to proliferate after a period of several months, and led to a cystlike formation.

Although the eye was quiet and the cyst was small in size, occasional pain experienced by the patient and mild ciliary injection indicated the beginning of an iridocyclitis. It seemed, therefore, imperative to have the cyst removed without further delay in order to avoid later undesirable complications.

Summary

A case of a pearl cyst of the iris is reported. It followed a perforating injury of an eye in which two eye lashes were carried into the anterior chamber.

The cyst developed eight months following the removal of the cilia at a site different from that of the original location of the cilia. The cyst, the size of a small pea, was removed through a corneal incision in an iridectomy.

The microscopic findings confirmed the clinical diagnosis of an implantation of "pearl" cyst. The importance of removal of these cysts while they are small, and before complications set in, is definitely stressed.

30 Fifth Avenue (11).

17 East 72nd Street (21).

I am indebted to Dr. Vera B. Dolgopol for the drawings. The photographs and photomicrographs are from the Department of Photography, New York Eye and Ear Infirmary.

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AUREOMYCIN AS PROPHYLAXIS AGAINST OPHTHALMIA NEONATORUM*

SAMUEL G. CLARK, M.D., AND ARTHUR M. CULLER, M.D.†
Columbus, Ohio

The introduction of two-percent silver nitrate as prophylaxis against ophthalmia neonatorum by Credé[1] in 1881 was one of the most important contributions in the history of ophthalmology. In his own series, the incidence of this dread cause of blindness was reduced from 10 percent to 0.4 percent. Nevertheless, even strict legislation and efficient social work have never reduced the incidence below approximately 0.1 percent in any part of the world. Seventy years after Credé's work two percent of blindness was still due to this devastating infection according to the estimates of the National Society for the Prevention of Blindness.[2] This apparently irreducible minimum was attributable to human fallibility and secondary infection.

Ophthalmia neonatorum is defined in most state laws as all inflammations of the eye occurring within two weeks after birth, although the incubation of infections likely to invade the eye from the birth canal, even including viruses, rarely exceeds nine days. It has been recognized for years that the gonococcus is not the only organism likely to invade the eyes of the newborn.

Various observers (Thomas,[3] Sorsby,[4] and

* Read before the East Central Section, Association for Research in Ophthalmology, January, 1950. This report is the result of a collaborative study of the problem of ophthalmia neonatorum, by the Departments of Ophthalmology, Obstetrics, and Pediatrics of Ohio State University and Mount Carmel Hospital, at the request of the Ohio State Department of Health, John Porterfield directing. Many individuals have contributed to the study. The authors consider themselves as only representatives of the group and particularly wish to thank Virginia Torbet and Adah Sutton for their contribution in bacteriologic examinations. They have undertaken this tabulation and evaluation of the results because the responsibility for prophylaxis against ophthalmia neonatorum rests primarily with ophthalmologists. Lederle Laboratories Division, American Cyanamide Company, Pearl River, New York, kindly supplied aureomycin hydrochloride for the experiment.

† From the Department of Ophthalmology and the Institute for Research in Vision, Ohio State University.

Thompson[5]) have demonstrated that other organisms, in particular some of the staphylococci, pneumococci, meningococci, and diphtheroids, were frequent causes of ophthalmia neonatorum. The possibility of virus infection was well supported by Thygeson[6] in 1936. He concluded that inclusion blenorrhea is a definite entity which is characterized by its time of onset, five to 10 days after birth, a duration of three to 14 months, and presence of cytoplasm inclusion bodies. Passage through filters and failure to grow on artificial media established the virus nature of the disease. Demonstration of the virus in the cervical epithelium of the mother and transmission experiments served to confirm the origin in the birth canal.

Lehrfeld,[7] in 1934, in a review of 2,000 cases of ophthalmia neonatorum in Philadelphia in which the Credé method was employed, observed that 28 percent were due to the gonococcus. He noted that the incidence was not materially reduced by vigilance in application of Credé prophylaxis but that the incidence of ophthalmia was reduced to one fifth in those hospitals in which the expectant mother's gonorrhea was treated.

In an investigation of ophthalmia neonatorum prophylaxis, Thygeson,[8] in 1936, found an incidence of 6.6 percent in 3,939 newborn receiving Credé prophylaxis utilizing one-percent silver nitrate prepared biweekly. Hemolytic Staphylococcus aureus was responsible for 51.7 percent, pneumococci for 13 percent, with one case of gonorrheal ophthalmia constituting 0.022 percent.

This problem of ophthalmia neonatorum has been altered in two important respects during the past 10 years, largely by the use of antibiotics. These drugs have provided such an effective treatment of gonococcal ophthalmia that, if therapy is instituted before the cornea is invaded, cure is swift and sure.

Before the use of fever therapy and antibiotics, the cure of ophthalmia neonatorum without any corneal scarring was a tribute to skilled nursing, vigilant social service, and efficient hospital organization. Now our armamentarium is so extensive that, even when penicillin sensitivity or penicillin-resistant strains of gonococcus are encountered, the vision of the patient is not seriously endangered.

Actually, gonococcal infection in the conjunctiva is more amenable to present therapy than some staphylococcal infections. This improvement in treatment is reflected in the gradual reduction of the incidence of ophthalmia neonatorum among children being admitted to schools for the blind.

Foote[2] estimated that "among 3,905 children in state schools and day classes for the blind in 1946-48, 292 or 7.5 percent were blind from ophthalmia neonatorum. This figure includes children from five to 18 years of age. Therefore, a more accurate indication of the current situation can be had from the fact that among 625 new admissions to schools and day classes for the blind in 1947-48, 14 or 2.2 percent were blind because of ophthalmia neonatorum."

Analysis of these 14 cases shows that all patients were born before 1945, when penicillin treatment of ophthalmia neonatorum became sufficiently available to affect these statistics, and a further decrease may well be expected in 1951 or 1952.

The second change in the problem is the diminution of exposure of the eyes to the gonococcus in the birth canal. More and earlier cures of gonorrhea are being effected. In addition, the public has become increasingly aware of the importance of prenatal care. Among other benefits conferred on society by prenatal clinics is the tremendous decrease in the incidence of gonorrhea in the mother. Possibly no baby is exposed to the gonococcus in the birth canal if his mother attended a vigilant prenatal clinic. The number of prospective mothers who do not take advantage of this service is now small, in this series 9.5 percent.

Since the demonstration of the efficacy of

penicillin in the treatment of ophthalmia neonatorum (Lewis[8] and others), several surveys have been conducted to compare the efficiency of penicillin with silver nitrate as prophylaxis against ophthalmia neonatorum.

In two reports embracing 2,887 newborn infants, Franklin[9] observed purulent discharge in six percent of babies following silver-nitrate instillation, in 2.1 percent of babies following three daily instillations of penicillin (2,500 units per cc.) and 1.1 percent of 1,177 infants who received a single installation of penicillin following irrigation of the eye with normal saline one hour after birth. Aerobic and anaerobic cultures showed staphylococci in 80 percent of those showing purulent discharge.

One infant in the series of 749 who received silver prophylaxis developed gonococcal ophthalmia on the fourth day. No gonococcal infections developed in the penicillin series. Other abnormal conditions noted are shown in Table 1.

TABLE 1

SILVER VS. PENICILLIN
(Franklin)

Prophylaxis	Swelling	Redness	Serous Discharge	Late Purulent Discharge
Silver	58%	72%	10%	2 readmitted
Penicillin (repeated)	31%	42%	2%	4 readmitted
Penicillin (single)	20%	37%	0.5%	2.9%

THE PRESENT STATUS

Following the favorable report on prophylaxis with penicillin, the situation was reviewed by a joint committee of the ophthalmologic societies.[10] Prophylaxis is now required by law in all states. Silver nitrate is mandatory in many. In some states the method of prophylaxis is left to the discretion of the director of public health. Legislation is slow and unwieldy. A satisfactory prophylaxis is now universally applied in the United States. Reopening the question might result in poorer control rather than an improvement.

In addition, the possibility of an alarming increase in penicillin-resistant strains might alter the value of this substance for prophylaxis. Berens and Foote[11] recommended that the Credé method be continued pending further investigation of the newer drugs.

Aureomycin was selected for this study because it appeared to have a wider range of activity among the bacteria likely to be present in the birth canal than any other antibiotic and because of the possibility that it might provide some protection against the virus infection of the newborn.

Chandler and Bliss,[12] in in vitro studies, found aureomycin to be less effective than penicillin against Gram-negative bacilli and Gram-positive cocci, respectively, with the exception of a number of strains of Streptococcus faecalis. Aureomycin was less effective than streptomycin against E. coli and K. pneumoniae.

Collins and co-workers[13] observed that aureomycin is relatively free of toxic effects when given orally even in fairly large doses. It was found to be highly effective against gonococci in vitro. Weight for weight it was much more active than streptomycin and sulfadiazine but much less active than penicillin. Paine, Collins, and Finland[14] noted equal sensitivity of penicillin- and streptomycin-sensitive and resistant strains of the same organism to the activity of aureomycin.

In another study,[15] the same authors found the drug taken by mouth to be effective in 66 cases of gonococcal urethritis although the results were inferior to those obtained with intramuscular penicillin in a prolonging agent.

Chen, Dienst, and Greenblatt[16] increased the amount of aureomycin administered orally to six gm. in divided doses over two days with 100 percent success in 20 unselected gonorrhea patients as opposed to 90 percent success in a similar number treated with 300,000 units of penicillin in oil and wax. They note the effectiveness of aureomycin in all five of the venereal diseases.

Braley and Sanders[17] found that the borated salt of aureomycin was effective in the eye against staphylococci, pneumococci, H. influenzae, moraxella, lacunata, and E. coli, as well as inclusion types. Administration at frequent intervals over a 48-hour period resulted in moderate irritation of the conjunctiva but this was not evident after single instillations.

Data in this study

A total of 1,442 infants delivered at Mount Carmel and University Hospitals, Columbus, Ohio, from December 1, 1948, to November 20, 1949, were observed daily during their hospital stay, usually seven days. As a control, 442 newborn infants were given silver-nitrate prophylaxis while 1,000 received aureomycin.

In silver prophylaxis the lids were wiped with sterile sponges moistened with warm water immediately after delivery. The wax ampule furnished by the State of Ohio Department of Health was punctured by the needle provided and two drops of the contained one-percent buffered silver-nitrate solution were instilled in each eye. No irrigation was employed but the excess was wiped free with a sterile gauze pad.

In the aureomycin series, a 0.5-percent solution of aureomycin hydrochloride with sodium chloride and sodium borate was obtained by the addition of five cc. of distilled water to 25 mg. of the powdered product as prepared commercially for ophthalmic use. Braley and Sanders[17] found the 0.5-percent solution prepared in this manner to have a pH of 7.5 to 7.8 and that this concentration was well tolerated. Maintenance at 4°C. was found to prolong activity for several days.

In one of the two participating hospitals the aureomycin solution was prepared at 48-hour intervals and refrigerated except during the period of instillation and returned without delay. In the other, due to lack of convenient refrigeration facilities, a new solution was prepared each day and though protected from heat and light as much as possible was not refrigerated. Under these conditions it was not felt that the antibiotic effect was seriously diminished.

TABLE 2

Cases developing purulent discharge

Purulent Discharge	1st Day	2nd	3rd	4th	5th	6th	7th
Silver	21.9%	1.8	0.9	0.2	0.4	0.0	0.2
Aureomycin	0.6%	0.1	0.7	0.4	0.3	0.1	0.0

The lids were wiped with sterile moist sponges immediately after delivery. Two drops of aureomycin were instilled in each eye followed by wiping of the excess but without irrigation. No subsequent instillations were made. After transfer to the nursery, each infant was examined daily for evidence of redness, swelling, or discharge. In the event of purulent discharge aerobic and anaerobic cultures were made. Blood agar, chocolate agar, and thioglycolate media were used routinely.

Of the 422 infants receiving prophylaxis with silver nitrate, 115 (26 percent) developed varying amounts of purulent discharge. None of these required or received treatment; 23 or 2.3 percent of the 1,000 infants receiving aureomycin prophylaxis de-

TABLE 3

OCCURRENCE OF BACTERIAL INFECTION

	1st Day	2nd	3rd	4th	5th	6th	7th
Watery Discharge							
Silver	13%	4.3	2.9	1.3	0.4	0.0	0.0
Aureomycin	3%	1.9	1.3	0.7	0.5	0.2	0.0
Swelling							
Silver	87.7%	61.5	37.3	19.9	7.9	0.0	0.0
Aureomycin	25.2%	22.1	14.5	7.2	1.8	0.8	0.0
Redness							
Silver	67.0%	28.9	13.0	1.8	0.68	0.0	0.0
Aureomycin	17.5%	13.0	9.2	5.2	0.8	0.0	0.0

veloped purulent discharge which also cleared without treatment. The relative percentage of cases developing purulent discharge each day after birth is shown in Table 2.

In addition to purulent discharge, watery discharge, swelling, and injection were tabulated. Even slight abnormalities were noted and our percentages showing some reaction are therefore higher than if slight changes had been disregarded as in some other studies (Franklin).

The daily curve of such abnormalities showed an immediate reaction to the silver on the day of birth and the succeeding day which was absent with aureomycin. Both series thereafter showed sporadic occurrence of bacterial infection (table 3).

The natural explanation of the inflammatory reaction occurring after silver-nitrate prophylaxis is that, since the superficial epithelial layer is destroyed by the drug, bacterial invasion is likely neither to occur nor clear so rapidly. To check this natural explanation, a consecutive series of 206 infants was studied. Cultures were taken in 49 cases which showed a discharge; 25 organisms were obtained from 24 patients. The remaining cultures showed no growth. This means that 11.6 percent of the babies had some bacterial infection in the eyes on the first or second day following silver prophylaxis. Table 4 shows the organisms isolated in order of frequency.

TABLE 4

CONTAMINATION OF CONJUNCTIVA FOLLOWING SILVER NITRATE

Organism	Number	Percent
Staphylococcus albus	12	76
Staphylococcus aureus	7	
Aerobacter aerogenes	3	12
E. Coli	1	4
Streptococcus, beta	1	4
Diphtheroids	1	4

In 1,000 infants treated with aureomycin, 23 showed some discharge. These cases were all cultured and 16 organisms were isolated from 14 cases (table 5).

TABLE 5

CONTAMINATION OF CONJUNCTIVA FOLLOWING AUREOMYCIN

Organism	Number	Percent
Staphylococcus albus	11	74.9
Staphylococcus aureus	1	
Caffkya tetragena	2	12.5
Diphtheroids	1	6.3
Nonpathogen	1	6.3

A summary of purulent secretion following prophylaxis shows:

Silver 115/442 = 26.0 percent
50 percent of cultures grew organisms
Aureomycin 23/1,000 = 2.3 percent
61 percent of cultures grew organisms

No infection with the gonococcus occurred in either series. One infant who received aureomycin prophylaxis was admitted, at the age of three weeks, to another hospital with purulent ophthalmia which was found to be due to a mixed infection by staphylococcus and diphtheroids.

COMMENT

In evaluating the relative merits of silver nitrate and the antibiotics, one must dis-

count the importance of discharge, redness, and swelling on the day of birth and the following day. Silver nitrate precipitates the proteins of the bacteria, as well as the superficial layers of epithelium in the conjunctival sac.

If this did not provide an avenue for the secondary invasion of bacteria and if it disappeared with further treatment, it would seem to be of little consequence. Bacteriologic studies, however, seemed to show that 50 percent of those patients having discharge were actually contaminated with bacteria. It would appear, therefore, that the high incidence of silver reaction may not be entirely innocent. Sporadic infection aside from this initial silver reaction was comparable in the two series.

The immediate reaction to silver was demonstrated to us on one occasion when we reverted to silver prophylaxis for a few days because of lack of aureomycin. On the second day, the supervisor of the nursery called to report that an epidemic of ophthalmia was sweeping the nursery. This proved to be only a normal silver reaction. For this reason all persons concerned with this experiment will be reluctant to return to the use of silver prophylaxis.

Berens and Foote state, "The facts with regard to possible ill effects of silver nitrate are clear. There is no evidence that permanent damage results from the use of one- or two-percent silver nitrate. Solutions left standing may reach a concentration as high as 50 percent. . . . However, furnishing one-percent silver nitrate in paraffin-lined beeswax ampules, as supplied by most health departments, has overcome danger to the eye from high concentration of the drug. A study by the National Society for the Prevention of Blindness in 1948, based on reports by 57 professors of obstetrics in approved United States medical schools, showed that 49 were using ampules. These professors reported 112,035 live births in their services in 1947. . . . There was no damage from silver nitrate among the 112,035 live births.

"If it should be established that penicillin or other antibiotic is as good as silver nitrate, it will be some time before the mode of administration, the strength of the solutions, and many other important factors are determined. For practical reasons, silver nitrate in paraffin-lined beeswax ampules is to be preferred at the present time for home deliveries."

The greater incidence of purulent discharge present in our series of infants receiving wax-ampule silver-nitrate prophylaxis (26 percent) as compared with those of Franklin, Thygeson, and others (approximately six percent) suggests that the product may be definitely more irritating to the conjunctiva than freshly prepared one-percent solution.

In order to establish the actual pH under clinical conditions of the buffered silver-nitrate solution supplied by the state of Ohio, samples were obtained from the delivery rooms and determination made with the Beckman pH meter. The mean hydrogen ion concentration of 40 ampules was found to be 4.20. The hydrogen ion concentration of freshly prepared one-percent silver-nitrate solution in fresh distilled water is 5.8 by the same method.

The high incidence of silver reaction in our series may be in part explained by the free nitric acid liberated by breakdown of silver nitrate. Irrigation shortly after instillation may further reduce the incidence of discharge. Since instillation without irrigation is the current procedure in this state, the method was accepted as the basis for the control series.

If the Credé method is to be continued, a by-product of this study is the realization that a critical analysis of the effect of irrigation on silver reaction and the stability of the silver-nitrate solutions in wax ampules should receive attention.

While it is apparent that the aim of prophylaxis against ophthalmia neonatorum has changed since the time of Credé, the primary interest of such a study must still be the

efficiency against the gonococcus. If vigilance in prenatal examinations were relaxed, or if vigilance in reporting and institution of prompt treatment were relaxed, danger of blindness as a result of ophthalmia neonatorum would recur. Effective treatment must be started promptly as some corneal scarring is inevitable if the cornea is invaded before the infection is brought under control. Any prophylaxis that is to be adopted generally must have been proven to be active against the gonococcus.

This is difficult to assay in a clinical study, such as this, in which we evaluate the efficiency of a drug against an organism that we make every effort to eliminate. Seventy percent of our patients were private patients and any statistics of the incidence of gonococcal infection in this group are too unreliable to record. In this series, 90.5 percent of all the mothers had adequate prenatal care.

Bacteriologic studies were done on this group and there were no gonococci found during the ninth month. It is very likely that the only possible exposure to the gonococcus occurred in the 137 mothers who had no prenatal care. If 10 percent (or 14) of these mothers had gonorrhea, we might expect one or two cases of gonococcal ophthalmia neonatorum, without prophylaxis. Obviously no conclusions as to the efficiency of aureomycin as a prophylaxis can be drawn from this series. Only a large experience would justify the modification of existing state laws.

A direct comparison of the efficiency of silver nitrate, the antibiotics, and zephiran might be made from animal experimentation. However, there is no experimental animal in which gonorrheal infection is comparable to human infection. Closely observed clinical trial, such as the present experiment, seems to be the best method of evaluation.

It is apparent that no serious sequelae were encountered in this trial of aureomycin and that it would be safe to extend the clinical trial of aureomycin as prophylaxis to include hospital deliveries in states where the mode of prophylaxis is prescribed by the state department of health and where reversion to silver could be accomplished easily if the use of aureomycin appeared to be less desirable.

Conclusion

The clinical and bacteriologic study of 442 newborn given prophylaxis against ophthalmic neonatorum with one-percent silver nitrate and 1,000 infants given a single instillation of 0.5-percent solution of aureomycin borate warrants the following conclusions.

1. Silver nitrate, as administered in the usual wax-ampule form, caused an immediate reaction of varying degrees of purulent discharge, redness, and swelling in approximately 20 percent of infants. This reaction subsided without treatment and there is no evidence that the prophylaxis produced any deleterious permanent effects. However, one half of those showing such reaction yielded a growth of bacteria, 75 percent of which were staphylococci.

2. The immediate silver reaction is probably diminished if freshly prepared, nearly neutral silver nitrate is used, and if irrigation with normal saline is practiced following the instillation.

3. No such immediate reaction followed prophylaxis with aureomycin.

4. The incidence of sporadic pyogenic infection was comparable in the two groups.

5. The eyes of infants seem to be particularly susceptible to pyogenic infection. The contamination of the eyes at home now seems to be the principal danger.

6. The dispensing of aureomycin or penicillin to the mother for use in cleansing the eyes during the first few weeks of life would contribute more to reducing the incidence of purulent infection than a change in the drug used for initial prophylaxis.

College of Medicine (10).

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CLINICAL TRIAL OF A NEW ATROPINELIKE DRUG*

THE USE IN OPHTHALMOLOGY OF ALPHA, ALPHA-DIPHENYL-GAMMA-DIMETHYLAMINOVALERAMIDE (BL 139), A SYNTHETIC DRUG WITH ATROPINELIKE ACTION

ARNOLD P. DRUCKER,† M.D.
San Mateo, California
AND
RALPH J. CAZORT,‡ M.D.
Nashville, Tennessee

Alpha, alpha-diphenyl-gamma dimethyl-aminovaleramide (BL 139)§ is one of a series of diphenyl substituted basic amides recently synthesized at Bristol Laboratories. Its atropinelike properties were first studied by Hoekstra and Dickison.[1]

In the form of the hydrochloride it is a white, odorless, bitter-tasting powder, soluble in water and alcohol with a pH of 6.8 in a one-percent aqueous solution. The structural formula, together with that of atropine, is shown in Figure 1.

The effects of BL 139 were compared to those of atropine in a variety of tests on experimental animals and on man.[2] These studies revealed that BL 139 was half as effective as atropine in blocking acetylcholine-induced contractions on the isolated guinea-pig ileum; it was equally effective as atropine in antagonizing the effects of acetylcholine on the blood pressure of anesthetized dogs; and was as potent as atropine in antagonizing the lethal effects of physostigmine in mice.

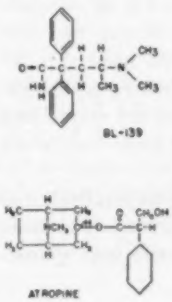

Fig. 1 (Drucker and Cazort). Structure of alpha, alpha-diphenyl-gamma-dimethylaminovaleramide (BL 139), and atropine.

* Preliminary report read before the Chicago Ophthalmological Society, May, 1950.
† Formerly of the Department of Ophthalmology, Cook County Hospital.
‡ Formerly of the Department of Pharmacology, University of Illinois.
§ Supplied by Bristol Laboratories, Syracuse, New York.

In man no significant difference existed between the antisialogogue effects of BL 139 and atropine. Further, the mydriatic effects of different concentrations of BL 139 and atropine were compared on the pupils of albino rabbits and it was found that BL 139 produced mydriasis equal in onset and degree to similar concentrations of atropine. However, the duration of mydriasis was shorter after BL 139 than after atropine. In man BL 139 was capable of producing mydriasis and cycloplegia both on local application and after oral administration.

Since the pharmacologic studies of BL 139 on animals and man showed it to be quite similar to atropine in its action, the new drug was tested clinically on more than 57 normal eyes and 63 eyes showing pathologic conditions. It has been used for refractions on patients ranging in age from four years to 35 years.

BL 139 has been used preoperatively for cataract surgery and postoperatively in cases of keratoplasty, extracapsular lens extraction, and complicated intracapsular surgery.

The wide range of iritic conditions in which it has been used includes: blunt traumatic, surgical, and chemical iritis; iritis secondary to acne rosacea keratitis; interstitial keratitis; hypopyon and phlyctenular ulcers; and herpes zoster ophthalmicus. Iridocyclitis of the granulomatous and nongranulomatous varieties have been treated with BL 139 including two cases of sympathetic ophthalmia.

It was tested in doses ranging from 0.5 to 5.0 percent for varying lengths of time up to two months with no untoward effects to date.

Six girls, all between the ages of 10 and 12 years and hospitalized for orthopedic problems unrelated to the eyes, were the subjects of a single-dose comparison of the effects of atropine ointment versus BL 139 ointment. Three of the children received a single dose of 1.0-percent BL 139 ointment and three received a single dose of 2.0-percent BL 139 ointment in the left eye while

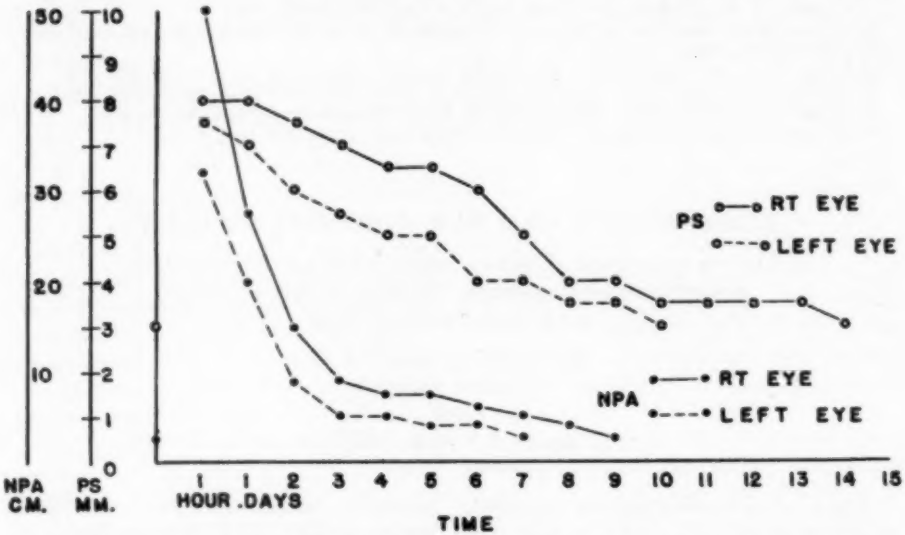

Fig. 2 (Drucker and Cazort). Comparison of the effects of BL 139 and atropine on near point of accommodation (NPA) and pupil size (PS) in a child. One-percent BL 139 = left eye; one-percent atropine = right eye.

all received a single dose of 1.0-percent atropine ointment in the right eye.

Figure 2 illustrates a typical response to a single dose of 1.0-percent atropine ointment compared to 1.0-percent BL 139 ointment. It may be seen that 1.0-percent BL 139 ointment was less effective both as a cycloplegic and as a mydriatic than 1.0-percent atropine ointment. On the other hand 2.0-percent BL 139 ointment was equally as effective as 1.0-percent atropine ointment (fig. 3).

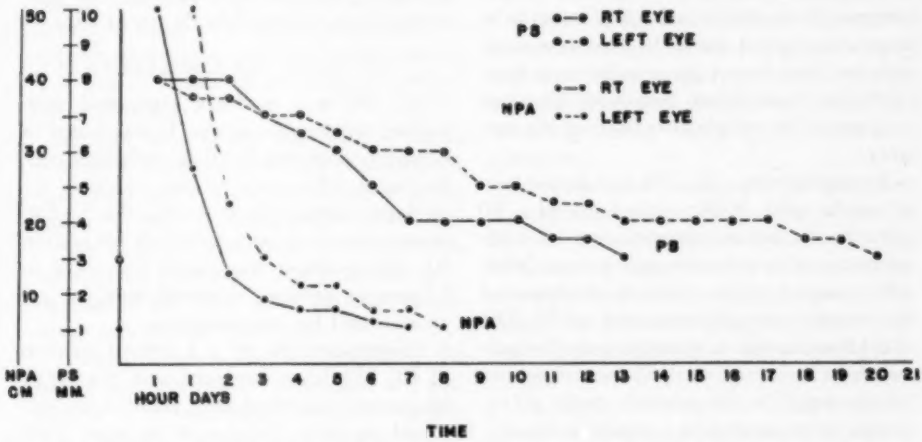

Fig. 3 (Drucker and Cazort). Comparison of the effects of BL 139 and atropine on near point of accommodation (NPA) and pupil size (PS) in a child. Two-percent BL 139 = left eye; one-percent atropine = right eye.

BL 139 has been found useful as a cycloplegic for refractions. When compared with 5.0-percent homatropine solution, 0.5-percent BL 139 caused noticeably less conjunctival congestion while giving approximately the same depth of cycloplegia. The cycloplegia lasted 24 to 48 hours longer than that due to homatropine.

Case reports

Case 1. C. K., a white girl, aged 16 years, had a diagnosis of an amblyopic esotropic left eye. With five drops of a 5.0-percent homatropine solution, the refraction was: R.E., +1.75D. sph. ⌒ +1.25D. cyl. ax. 100° = 1.2−; L.E., +1.75D. sph. ⌒ +0.75D. cyl. ax. 95° = 0.4.

With five drops of 0.5-percent BL 139 solution, the refraction was: R.E., +2.0D. sph. ⌒ +1.50D. cyl. ax. 95° = 1.2−; L.E., +1.75D. sph. ⌒ +0.50D. cyl. ax. 95° = 0.4+.

Case 2. R. B., a white boy, aged 13 years, had a diagnosis of right esotropia. With five drops of 5.0-percent homatropine solution, the refraction was; R.E., +1.0D. sph. ⌒ +0.25D. cyl. ax. 180° = 0.8+; L.E., +1.0D. sph. = 1.0.

With five drops of a 0.5-percent BL 139 solution, the refraction was: R.E., +1.25D. sph. ⌒ +0.25D. cyl. ax. 180° = 1.0; L.E., 1.0D. sph. = 1.0.

Cycloplegia comparable with that resulting from the use of 1.0-percent atropine sulfate ointment was obtained with a 2.0-percent BL 139 ointment. The duration of the cycloplegia, however, was slightly shorter with the BL 139.

Case 3. R. S., a white boy, aged eight years, had a diagnosis of alternating esotropia. A 1.0-percent atropine ointment instilled four times daily for four days gave the following refraction: R.E., +3.75D. sph. = 0.8+;

L.E., +5.0D. sph. ⊂ +0.75D. cyl. ax. 85° = 1.0−.

A 2.0-percent BL 139 ointment instilled four times daily for four days, showed a refraction of: R.E., +4.0D. sph. = 1.0; L.E., +5.0D. sph. ⊂ +0.75D. cyl. ax. 85° = 1.0−.

BL 139 has been found useful as a preoperative mydriatic when used in a 1.0-percent solution (five drops) one hour before surgery. Its mydriatic action was found to be augmented by the use of 10-percent neosynephrine (two drops) given at the same time. With the combination, maximum dilatation was attainable and persistent despite iris surgery.

Postoperatively, BL 139 maintained mydriasis in spite of the copious use of a 2.0 percent pilocarpine ointment and of 0.25-percent eserine ointment applied immediately after surgery. Only repeated instillation of the miotics overcame the action of BL 139. BL 139 ointments in strengths up to five percent have been employed postoperatively with results equal to those which could be expected from atropine in comparable cases.

The new drug has been used in medical ophthalmic cases for the same wide range of pathologic conditions for which one employs atropine, scopolamine, or homatropine—and with comparable results. An acute tension rise in narrow-angle primary glaucoma has been precipitated by the use of BL 139.

The most promising use for this drug as a mydriatic and cycloplegic seems to be in patients sensitive to the belladonna alkaloids. To date no sensitization to BL 139 has been known to occur in any of the 120 eyes medicated. The majority of the patients have used 2.0-percent ointment, three times daily, for one to four weeks.

Twelve patients showing moderate to extreme sensitivity to the atropine group of drugs were treated with BL 139. Because of the nature of their ocular condition, therapeutic mydriasis and cycloplegia had to be continued despite atropine dermatitis and chemosis. Not one of these patients became sensitive to BL 139 and all were relieved of their atropine dermatitis and conjunctival chemosis. Their ocular conditions were well controlled or improved by the use of BL 139.

Summary and Conclusions

BL 139 is a synthetic compound with marked atropinelike action. It was tested in a variety of ophthalmic clinicopathologic conditions. A 0.5-percent solution produced cycloplegia comparable with that due to 5.0-percent homatropine solution. A 2.0-percent BL 139 ointment was found equivalent to 1.0-percent atropine ointment both for refraction and for therapeutic use.

Preoperative use of a 1-percent solution of BL 139, when combined with the use of 10-percent neosynephrine, resulted in sustained maximal dilatation of the pupil. Pilocarpine and eserine were found ineffective when used following BL 139 administration.

Primary glaucoma was precipitated or aggravated by the use of this drug.

The most valuable use for BL 139 in ophthalmology appears to be in the patient sensitive to the atropine group of drugs. None of 12 patients definitely sensitive to atropine have shown untoward response to the new drug and all have been benefited from its use.

406 North San Mateo Drive.

Meharry Medical College.

We are indebted to Dr. Klaus R. Unna and to Dr. James E. Lebensohn for their advice and encouragement.

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ON THE ETIOLOGY AND PATHOLOGY OF PTERYGIUM*

MICHELE GERUNDO, M.D.
Omaha, Nebraska

INTRODUCTION

Pterygium is a disease characterized by a fibromembranous or fibrovascular expansion of the scleroconjunctival tissue. It is prevalent in countries along the equatorial belt. It may be single or bilateral; when single, it appears on the nasal side, and, when double, it is usually located on the temporal side of the ocular globe.

Merigot de Treigny and Coirre[1] define pterygium as an ocular disease characterized by a membranous growth on a level with the bulbar conjunctiva. Duke-Elder[2] states that a fully developed pterygium is covered with conjunctival epithelium, with numerous goblet cells in the depressions forming glands which may develop into cysts.

Although known since ancient times, the nature and etiology of pterygium are still matters of speculation. Bidyadhar[3] reports that Susruta, thousands of years before Christ, was the first surgeon-ophthalmologist to treat pterygium extensively.

Following the ancient conception of Susruta, Bidyadhar, too, believes that the nutritional state of the individual is an important factor in the development of pterygium. Prevention, according to him, consists in improving the corneal nutrition by improving the general health of the patient, revitaminization of the eye by means of a diet of milk and fruit juice, and treatment of nasal and dental infections.

THEORIES OF ETIOLOGY

Morax[4] attempted to establish that pterygium was a manifestation of lymphogranuloma but, in view of the negative Frei reactions, he rejected the hypothesis. Coutts, Lugue, and Hewitt,[5] on the other hand, found some granular bodies in the cytoplasm, as well as extracellularly, which were similar to those seen in lymphogranuloma. One patient, who had contracted lymphogranuloma by the genital route four years previously, developed a bilateral pterygium.

Garcia de Acevedo[6] finds that pterygium is more common among fishermen who are exposed to winds, dusts, glare, and temperature variation, and that ocular leprosy is a favorable factor for the development of pterygium.

Doherty[7] is of the opinion that pterygium is expression of the need of the cornea for protection from external irritation, "a call to nature to supply a nictitating membrane corresponding to the palpebra tertia of animals." For him the etiology is unknown, but heat, dust, sunlight may act as constant irritants.

He rejects the idea that a pinguecula is a precursor of pterygium, because the former is made only of degenerated connective tissue fibers containing concretions of hyalin substance and it may recede and disappear.

Fuchs[8] held the view that pterygium was an encroachment of a pinguecula upon the cornea and was degenerative in nature. Amman[9] admits that pterygium originates from a pinguecula, beginning as a circumscribed thickening near the nasal side of the corneal rim. He considers that, in addition to a constitutional predisposition, living in the open and exposure to light, wind, and dust plays an important role in the etiology.

Coleman[10] feels that although a pinguecula is not to be classed with a pterygium, the degenerative processes at the limbus associated with the pinguecula predispose to pterygium by interference with the nourishment of the cornea. Duke-Elder,[2] who does not identify pinguecula and pterygium as one process, expresses the view that both conditions are degenerative in nature and are due to such

* From the Department of Pathology, Creighton University School of Medicine.

factors as exposure to wind and dust and the geographic location.

Wille,[11] on the basis of a large collection of cases, concluded that pterygium and conjunctivitis aestivalis are intimately related to keratitis ramificate superficialis. Pterygium, which is caused by the keratitis, may recede, if the latter condition is effectively treated.

Kamel[12] strongly supports the view that the disease is definitely an inflammatory condition. Keratoconjunctivitis, according to him, follows the development of pterygium rather than precedes it. He rejects both the neoplastic and degenerative hypotheses because hyalin and amyloid metamorphosis are only late findings in pterygium.

Pterygium does not occur if the cornea or the conjunctiva alone is affected, but only when both are involved. With formation of tissue bands in both cornea and conjunctiva and successive contraction, a pterygium is established.

In his study, carried out on Egyptian patients, Kamel attributes importance to the quality of the sandy dust and possibly to impairment of the lacrimal passage, which prevents particles of dust from being eliminated properly.

Fuchs[13] attempted to study the chemical nature of the stroma. It has a homogenous character, refractive power, resistance to acids and alkalies, and deep-staining qualities with carmine, picrocarmine, and eosin.

Beard and Dimitry[14] report that the tissue boiled with chloroform gives a faint cholesterol reaction and is not precipitated with digitonin. The application of choline chloride to pterygium dilates the lesion's vessels, which become greatly engorged with blood; at the same time, the fatty substances present in the growth disappear.

Formation and transportation of phospholipids may occur here, as is the case when choline carries on its lipotropic function by removing fatty material from the liver.

On the basis of such findings, the two authors, who are not in favor of the irritation theory, wonder whether the formation of the pterygium is due to a choline deficiency in adults.

Methods of study

The present study is based upon the examination of 25 cases collected in Hawaii.

A questionnaire was prepared and was filled for each patient. The questions asked were:

Age Sex
Where born
Length of time in present residence
Occupation
Economic status
Outdoor activity (fishing, swimming, climbing, driving)
Field activity (occupational)
Protection used against sun glare (wearing of lenses, sun glasses, visor)
Any previous disease of the conjunctiva
Any complaint of excessive lacrimation preceding the onset of the present ailment
Duration of the present ailment
History of any injury to the eye (excessive rubbing, dust particles, blunt object)
Reasons for consulting a specialist
Clinical findings

The specimens were preserved in a sterile container and immediately sent to the laboratory. There, always under aseptic condition, they were cut into two unequal parts—one, the larger, reserved for histologic examination and the other for bacteriologic examination.

The tissue was stained with hematoxylin-eosin, Masson's trichrome, and Bielschowski's reticulin stain. The fixative used was Bouin's fluid which, in addition to allowing a number of staining methods because of its property of staining tissues a light yellow color, makes sectioning of small pieces easier.

For bacteriologic purposes, the piece was minced with a sharp knife and smeared on chocolate agar, tryptose phosphate agar, Loeffler's serum, and thioglycollate medium. Five specimens were also cultured on chorionic-allantoic membrane of chick embryo. When no growth took place within 24 or 48 hours, cultures were kept in an incubator for a period of 15 days before being discarded and considered negative. With the material left after culturing, smears were

prepared and stained with Giemsa and Gram stains.

Results

1. Analysis of questionnaires

In this small series, both sexes were represented, although there was a slight and insignificant greater number of men. The age range was from 30 to 60 years and usually the patients had suffered from the ailment for many years. The condition had its onset well in the third decade. There was only one single exception, a girl, aged 19 years, a student in high school.

The large majority of patients were Filipinos; the rest of them were Japanese or born in Hawaii of Japanese, Filipino, or Portuguese descent. The absence from this series of American-born patients who lived in the Islands does not, however, imply a racial immunity. I was personally acquainted with two doctors now suffering from progressive pterygium who had been living and practicing on plantations for many years.

All the patients had been living continuously in the Islands either all their life or for a number of decades. They were all laborers on plantations with the exception of the high school student, one carpenter, and one mechanic. Their economic status was generally poor and their outdoor activities and hobbies very limited or none.

At work they never wore glasses for protection against sun glare. Only one stated that he had used, for a time, some dark glasses bought in a department store but that he had discarded them because "they were too strong for his eyes."

Four of the women were housewives who, however, had worked before marriage and were living on plantations with their husbands who were common laborers in the field. No one had had any previous disease of the conjunctiva and only one half of them admitted excessive lacrimation just preceding the onset of the present ailment.

The duration of the disease varied considerably. Two elderly men admitted that they had had the growth in their eyes for 30 years; another had been suffering for 20 years; three others for 10 years; the rest estimated the duration from five years to a few weeks. One only stated that the growth had developed in his eye in five days (?).

The majority of the patients could not remember any history of injury. Two referred patients said that their complaint began with dust particles in the eye, and one patient attributed his ailment to an eye injury by a cane leaf.

Most of them came to the specialist because of a growth in the eye; very few had come because of poor vision. One patient, who estimated the duration of the ailment to be about two weeks, complained of blurred vision, pain, and lacrimation of the right eye.

When unilateral, the pterygium was found more commonly in the right eye. The reason for such predilection is not quite clear, unless one likes to speculate upon the predominance of right-eye vision. Bilateral pterygium was found in almost half of the patients.

2. Pathology

From both the gross appearance and the histopathologic picture, the growth of a pterygium can easily be divided into three phases: (1) Proliferative papillomatous, corresponding to the progressive form described by ophthalmologists; (2) fibromatous, in which the connective tissue is more prominent but the vascularity is less evident, corresponding to the stationary form; (3) atrophic-sclerotic phase with collastinic metamorphosis in which there is no further growth, corresponding to the arrested form.

When the head of the pterygium is fully formed, it resembles a triangular fleshy vascular growth as it pushes forward toward the cornea. The conjunctiva at the base is thrown into folds, which run backward toward the sclera. When vascularity is reduced, the pterygium appears paler and firmer be-

cause of the increased density of fibrous tissue.

1. *Proliferative papillary.* The proliferation of the connective tissue and the multiple rows of the conjunctival epithelium suggest the arrangement of a papillary tumor. The epithelium is arranged in long, deepening folds or digitations that sometimes resemble long tubular glands.

The many swollen epithelial cells, with dense nuclei and clear cytoplasm, resemble goblet cells. The connective tissue contains a moderate number of cells and congested vessels. At times it is made of loose undulated fibers with a moderate number of nuclei. Lymphatic vessels contain an acidophilic amorphous substance, seeming to indicate a lymph stasis.

2. *Fibromatous.* In this stage, the epithelium is loose and edematous, and the pyknotic nuclei stained deeply. At times the epithelium appears stretched and the cells are flattened. The connective tissue is dense, sometimes proliferating between the epithelial folds and isolating them in small islands. The tissue does not appear as cellular as in the first stage, but at times it does give the impression of a fibroma. The vessels are few and do not appear so congested as in the first phase.

3. *Atrophic-sclerotic.* This phase is characterized by pronounced atrophy of the epithelium and dense sclerosis and hyalinization in the subepithelial layers. The epithelium may be entirely lost or appear palely stained; sometimes, when it resembles continuous lamina, it is practically impossible to make out any cellular details, as if it were hyalinized.

The connective tissue is reduced to an amorphous acellular mass undergoing hyalinization and occasionally containing areas of what appears to be calcium deposits. The few remaining vessels appear completely empty or collapsed.

3. Bacteriologic results

In the series under study—as has been mentioned—one patient claimed that the pterygium had started five days before; a second one set the date of onset at about 15 days following removal of dust particles from her eye two or three weeks previously; a third one set the date at three months. In these three cases, small nonmotile Gram-negative bacilli in pairs or short chains were isolated from the chocolate-agar culture.

A bacillus measured approximately 1.0 μ by 2.0 μ, was nonmotile, and nonsporiform. It did not grow in ordinary media, such as nutrient agar and gelatin, but it grew well in blood serum, with production of liquefaction around the delicate grayish colonies. On chocolate agar, the bacillus was cultured in a pure state with formation of small, transparent, circular colonies.

The bacillus fermented only glucose with production of acids and no gas, did not produce indol, did not reduce nitrates, and left litmus milk unchanged. The cultures were lost after three or four transplants. On the basis of the findings, the bacillus was identified as Moraxella lacunata, or Morax-Axenfeld bacillus.

In three other patients, who had the pterygium for about one year, the culture grew this bacillus mixed with a small nonhemolytic staphylococcus. Every effort to isolate the two bacteria in pure colonies was fruitless; each thriving separate colony always contained both species. Because of the intimate association, it was considered superfluous to attempt any further identification.

In the cases of longer standing, either no growth was obtained or only staphylococci were cultured.

No growth or lesion was produced on the chorio-allantoic membrane of chick embryo.

Comment

It is difficult to agree with Fuchs,[8] Amman,[9] and Coleman[10] that the pterygium is a degenerative process. The presence of an inflammatory reaction, increased vascularity, the proliferation of fibrous tissue, and in the last phase, the scar tissue point to an inflam-

matory reaction. In the present material there is nothing to indicate a degenerative process.

The atrophy of the epithelium, which follows in the course of pterygium, is easily understood in the light of the inflammatory process underneath and the scanty blood supply. As long as the pterygium is vascular, the epithelium does not appear atrophic; on the contrary, in the first phase it gives the impression of taking part in the proliferative process.

Hyalinization and other regressive characteristics, observed in the third (and sometimes in the second) stage of the pterygium, are secondary to the inflammatory processes, just as they are in other organs following a chronic inflammatory process.

It is hardly possible to accept a teleologic explanation of the pterygium. This lesion is not analogous to skin and choroid pigment, by means of which the organism defends itself against the light.

The idea that nature would attempt to provide a nictitating membrane as a response to glare seems no more true than the conception of phagocytosis as a defensive reaction. If such were the case, pterygium should be a more common occurrence among those who spend many hours of the day in the open air.

Although it is difficult to establish any etiologic relationship between the bacillus (isolated in three cases) and the pterygium, it seems significant, that it was present only in those cases seen during the early proliferative phase. Since it is known that the Morax-Axenfeld bacillus may cause chronic lesions of the conjunctiva and cornea, its presence cannot easily be regarded as a coincidence.

It is possible that the bacillus stimulates a chronic inflammation in an eye which is already irritated by dust and glare. When fibrosis and hyalinization set in, no more bacteria are found; such is the case in any inflammatory process in which the organism has reached the stage of fibrous proliferation.

Rodin,[15] in a bacteriologic study of human conjunctival flora, found in normal eyes staphylococci and (once) streptococci; in acute conjunctivitis, he found Staphylococcus aureus more frequently than other staphylococci, then Streptococcus, Sarcina, Gaffkya, Alkaligenes, diphtheroids.

The conception of an infectious agent inciting a chronic inflammatory process is well in agreement with Wille's findings[11] that pterygium and conjunctivitis aestivalis are intimately related to keratitis ramificata superficialis. According to this author, however, the pterygium represents a sort of natural healing by means of which the conjunctiva bulbi attempts to cover the denuded part of the cornea.

This is, again, a rather teleologic conception of pterygium similar to that of Doherty.[7] It must be noted that, for Wille, keratitis ramificata superficialis is due to such climatic influences as heat, glare, wind, and dust—exactly the same causes claimed by other authors for pterygium. He was unable to carry on any bacteriologic investigation, though it would have been a notable addition to his contribution.

The role of nutrition in the development of pterygium, as claimed by Bidyadhar,[3] should not be underestimated. Most of the cases in the present series came from the laboring class, but it has been pointed out that pterygium has been observed among professional workers who were economically able to provide for excellent nourishment. It is true also that, because of their occupation, the laborers were exposed to all the various climatic factors invoked for pterygium; whereas, those of a higher-income group do not spend all day working in the field exposed to heat, glare, and dust, and usually use protective glasses for their outdoor activities.

There is no doubt that glare and, possibly, dust play an important role in the development of pterygium. In the the present series the large majority of the patients were exposed to sunlight for many hours of the day and none wore protective goggles.

The role of the dust is more doubtful. Apart from the fact that, in Hawaii, dust storms are not common, only two patients complained of dust particles getting into their eyes, although it is possible that the other patients might have had finer particles which did not inconvenience them. The contention of Kamel[12] that the quality of the sandy dust and impairment of the lacrimal passage are important in the development of pterygium may be true in Egypt, but it does not apply to Hawaiian patients.

Summary

From an analysis and pathologic and bacteriologic studies of 25 cases of pterygium it is concluded that:

1. Exposure to sunglare may be an important factor in causing the disease.

2. Dust plays a very limited role.

3. The condition is inflammatory in character and may be divided into three phases: (1) Proliferative papillomatous, (2) fibromatous, and (3) atrophic-sclerotic.

4. The Morax-Axenfeld bacillus has been cultured in early cases, but no growth or only growth of staphylococci has been obtained in the cases of long standing. The Morax-Axenfeld bacillus probably initiates the inflammatory process; however, it disappears when the acute phase ceases and the stationary phase begins.

Creighton University,
School of Medicine (2).

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NUTRITIONAL AMBLYOPIA*

ADALBERT OBAL, M.D.
Berlin, Germany

Recent publications on "nutritional amblyopia" induced me to watch for similar cases of eye-diseases in my patients, the greater part of whom suffered from nutritional deficiencies.

Bloom, Roberts and Willcockson, and Carroll refer to patients of the same class as those I treated in Berlin after the end of the war. Most of my patients were prisoners of war returned from Russia. Since Berlin was the transit-center for Eastern refugees and released prisoners of war, it was possible to study a great number of such people. In addition many patients from the environs of Berlin, where nutritional conditions had been very poor, had been under observation for several years so that it was possible to obtain a good picture of the whole onset of the disease.

RETROBULBAR NEURITIS AFTER WORLD WAR I

Similar cases of retrobulbar neuritis were observed and described in Germany after World War I. The disease was known as retrobulbar neuritis in soldiers. During the years 1916 to 1920 authors emphasized that, in normal times, such retrobulbar neuritis was seldom observed, while during the war many cases of optic neuritis of unknown etiology occurred. The only common characteristic was that all the patients had suffered from severe privation—hunger, cold, nervous strain, and so forth.

Stock (1916) was the first author to look upon nutritional deficiency as the cause of this eye affection and he stressed the favorable effect of an adequate diet. All other authors, however, objected to Stock's opinion, considering neurologic reasons, especially multiple sclerosis, the cause of the visual disturbance.

Dinser (1919) reported 30 cases with central scotomas and without an affection of the sinuses. In all his cases but one, central scotomas remained in spite of all treatment.

Junius (1919) pointed to the increase of retrobulbar neuritis during the war, an increase he could not explain by usual causes. His opinion was that "the bad living conditions of wartime enabled bacteria or their toxins to settle on the optic nerve." In contradiction to others he did not consider multiple sclerosis to be the cause of this eye disease. Similar observations were made by Kafka (1919).

Other authors described similar findings. Szymanowski, for example, reported six cases of retrobulbar neuritis in soldiers. Each showed a central scotoma with an unfavorable prognosis and an unknown etiology. He regarded the heavy strains of the war as the only reason.

Scheffler (1919) reported 37 cases of retrobulbar neuritis in civilians and soldiers, beginning from 1914, the greater part of which had an unknown etiology, although in 12 cases multiple sclerosis seemed to be the cause.

Van Hippel (1923) observed 120 patients with optic neuritis during the war. For the greater part of them the etiology could not be explained.

NICOTINE AMBLYOPIA

Although nicotine amblyopia cannot be regarded as a direct consequence of malnutrition, there is certainly some connection between dietary deficiency and a decreased resistance against the toxic influence of nicotine. In the literature are many papers, written in former periods of general poverty and

* From the Ophthalmic Department of the Municipal Hospital, Berlin-Wilmersdorf, and the Free University of Berlin. Presented at the meeting of the Berliner Gesellschaft für klinische Medizin, February, 1949.

hardship, which also report an increase in the number of cases of nicotine amblyopia.

Holth observed, in 1899, that in times of strikes and industrial trouble many workers suffered from tobacco amblyopia. The strikers' nutrition was then most deficient. The visual disturbances disappeared (even in excessive smokers) when, after the strike, nutrition became more normal.

Fehr (1919), as well as Meyerhof (1921), stressed the frequent occurrence of tobacco amblyopia toward the end of the war. Bachstez and Purtscher (1920) and Jendralski (1921) reported on a toxic amblyopia which occurred in the years of malnutrition in Vienna and Berlin.

Before the war, however, this syndrome was practically unknown, being found only and occasionally in those patients who used nicotine to excess.

De Schweinitz and Fewell regarded disturbances of intestinal resorption caused by nicotine as the main reason for nicotine amblyopia and the accompanying polyneuritic symptoms.

In my cases pipe smoking was especially frequent. Among the released prisoners of war were excessive smokers who, since they had had little to smoke in the prison camps, had smoked tobaccos of inferior quality or substitutes. But nonsmokers, too, got amblyopia.

In typical cases, the shape of the scotoma and the onset of the disease enabled one to distinguish easily a nicotine amblyopia from a nutritional one. The scotomas of nicotine amblyopia were characterized by their transverse-oval shape. They were situated between the fixation point and the blindspot and were surrounded by a more extended centrocaecal color scotoma.

Nutritional amblyopia

The Anglo-American reports, as well as my own observations, confirm the fact that nutritional amblyopia does occur as a consequence of severe undernourishment in persons who are disposed to this eye disease.

The greater number of patients herein reported (former prisoners of war) had as their main symptom an impairment of central vision without any objective alterations of their eyes. Remarkable was the fact that often the fixation point and a small field around it showed good function, thus transforming the central scotoma of nicotine amblyopia to a ring scotoma.

The nearly identical histories and the similar onset in all my patients led me to the assumption that all these cases were of the same character. In German the disease was called "Inanitionsamblyopie" (malnutritional amblyopia).

The characteristic symptoms were: relative central scotoma or ring scotoma, failure of color vision (greatest for green), and an increased dazzling (nyctalopia). The general symptoms in these cases were: generalized edemas; polyneuritic symptoms, such as itching and paresthesia; weakness of the legs; such skin symptoms as furunculosis, dermatosis, hyperceratosis, and other skin signs similar to those in pellagra.

The food supply of the civilian population in Berlin and in the Soviet zone was poor, too, although in general not nearly so bad as that of the greater part of the prisoners of war. Many cases of amblyopia were, therefore, observed among civilians. These patients were usually in an older age group than the released prisoners of war, the average age being about 60 years.

Generalized edemas were rarely found in older people, while sensatory symptoms (itching and paresthesias, especially of the fingers and toes) frequently occurred. In many cases blurring of vision was combined with intestinal diseases, such as chronic gastritis, ulcus ventriculi et duodeni, and so forth. We may suppose that these intestinal affections prevented food, which was then deficient in any case, from being digested and resorbed, with the result that malnutrition became more severe.

ONSET

In many of our cases dimness of vision began after a long stay in the hospital. In addition to an inadequate diet, there were other factors which caused a deterioration of the patients' general physical condition. One patient, for example, lost more than 20 Kg. of weight while lying in a painful surgical stretch-dressing. Others suffered from intestinal diseases, such as stomach and duodenum ulcers, which also caused a considerable loss of weight. A large number of the prisoners of war were greatly exhausted on their return and had to be hospitalized at once.

The symptoms of nutritional amblyopia, however, did not, for the most part, appear until after two or three months in the hospital, which means that the hospital diet probably could not prevent this eye disease. The severe damage from malnutrition, however, had occurred during confinement in the prison camp several months or years before.

From the histories of over 40 paitents, I accumulated the following findings concerning the onset of the eye disease. At first small negative paracentral scotomas could be perceived. When trying to read, patients realized that letters of the words were missing, and lines seem to be divided into parts. Small objects were suddenly lost from vision.

These small paracentral scotomas gradually coalesced. Since patients become alarmed by the entire loss of central vision, they can usually give the exact date when this symptom appeared, while paracentral scotomas may often remain unnoticed.

The rapidity with which vision deteriorated seemed to depend on the extent of the malnutrition. The development of the clinical picture of the disease rarely takes more than three weeks. Blurring of vision often comes over night or within a few days. The patients see everything "as if looking through an opalescent glass pane." They can neither read nor distinguish faces. There are many complaints of photophobia.

TABLE 1

CAMPIMETER FINDINGS IN CASES OF NUTRITIONAL AMBLYOPIA

Number of Patients	Ring Scotoma	Relative Central Scotoma	Centro-caecal Scotoma	Central Scotoma	Paracentral Scotoma
39	20	3	10	4	2
Excessive smokers among them (more than 10 cigarettes a day)	5	1	7	1	0
Average duration of disease at date of examination	2¼ yr.	4 mo.	1¼ yr.	2 yr.	5 yr.
Average age (years)	36	37	59	39	32

SUMMARY OF FINDINGS

Each of our patients underwent a thorough slitlamp examination, refraction under homatropine mydriasis, and an ophthalmoscopic examination with the Gullstrand binocular ophthalmoscope. The visual field was examined with the Maggiore perimeter (Zeiss) and the Bjerrum campimeter (table 1).

In recent cases, external examination showed edema of the face, especially in the region of both parotid glands.

The anterior part of the eye as well as ocular motility and pupil reaction would prove to be normal. The conjunctiva was, as a rule, not irritated. There was no xerosis; the cornea was clear, its sensitivity intact. Sometimes an increased vascularization of the limbus was found.

Funduscopic examination revealed, in

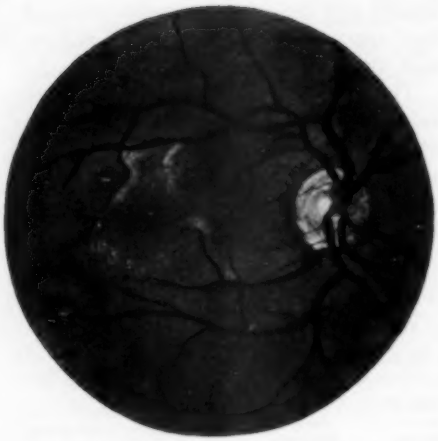

Fig. 1 (Obal). A recent case of nutritional amblyopia. W. P., a man, aged 36 years, returned home after two years in a prison camp with a case of severe malnutrition. He had lost 20 Kg. of weight. Edema and polyneuritic symptoms were present. Six weeks later he suffered severe blurring of vision, photophobia, nyctalopia, and reading disability. An eye examination two months later showed vision of 2/20, a relative central scotoma, moderate dilatation and increased tortuosity of the retinal blood vessels, and no typical macular reflexes. After one year's treatment, vision was 6/6 at the fixation point, there was a typical ring scotoma, and the reading disability remained. His general physical condition had become normal.

fresh cases, a moderate retinal hyperemia and an increase in the tortuosity of the retinal blood vessels (fig. 1).

The discs appeared reddish and not sharply demarcated. The macular area showed increased and atypical reflexes, surface irregularities, and a more intensively red color of the fovea.

Vision was greatly decreased, to as much as one tenth to one twentieth of normal.

In cases of longer duration, the only objective finding was a temporal pallor of the optic discs. We often saw alterations of the macula, missing or atypical reflexes, moderate surface irregularities, or a granulation of the macular pigmentation.

In most of our cases, both eyes were afflicted simultaneously with the visual disturbance, and mostly to an equal degree. If there were differences in the left and right eyes, the dominant eye seemed to be stricken earlier and more acutely. On the other hand, the restoration of vision was more complete in the dominant eye, so that finally this eye showed a better function and smaller scotomas than the other.

As a rule only central vision was affected, peripheral vision remained intact. Local orientation was, therefore, not impaired, and the patients could move without any guidance. Complete blindness was never observed during the course of the nutritional amblyopia.

With normal peripheral limits of the visual field, recent cases showed relative central scotomas of 10 to 15 degrees for white and colors. In spite of a considerable blurring of vision one often could not at first find any absolute scotoma on campimeter examination. This first stage, which on examination with the usual black Bjerrum curtain did not show absolute scotomas, was called the stage of amblyopia (fig. 2).

Within some weeks or months, the relative central scotoma changed, usually in the following way: A small visual rest appeared in the middle of the scotoma, the surround-

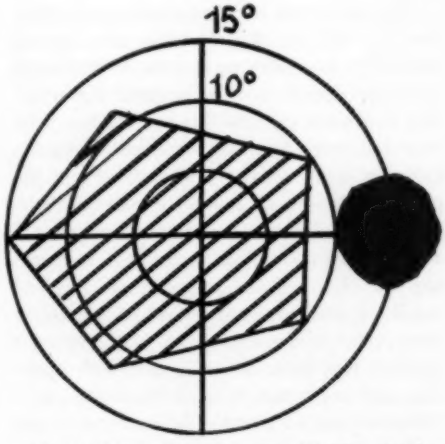

Fig. 2 (Obal). The right eye of H. D., showing a relative central scotoma about two weeks after the first blurring of vision. Vision: 3/35, Nieden 10, no recognition of colors. (White, 3/2,000.)

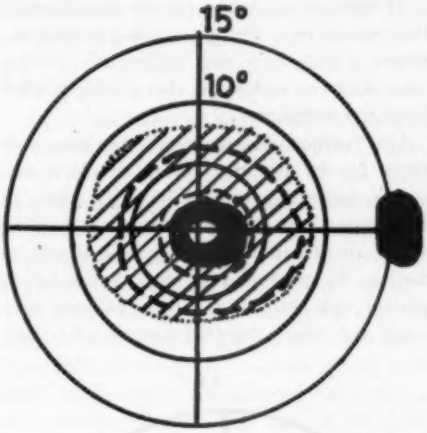

Fig. 3 (Obal). Right eye of L. S., showing a relative ring scotoma about four months after the first blurring of vision. (---- red; .... green; .-.- blue; white, 3/2,000; colors, 10/2,000.)

ing relative scotoma condensed to an absolute one (fig. 3), and a ring-scotoma was formed, the central rest of which was at first very small (less than a visual angle of 1 to 2 degrees).

COMMENT

Older cases, with ring or paracentral scotomas, showed full central vision (5/4 and Nieden 1) (fig. 4). Central vision in these cases is never an absolute measure of the severity of this eye disease. The visual disturbance can be tested more exactly by the capacity to read single ciphers and shorter or longer words. On reading test charts, patients can tell the size of their paracentral scotomas and state, for example, that they see one cm. of the print clearly at the distance of one foot, while vision of their surroundings is fading.

Some of my patients learned to use this central visual rest for seeing at distance or near. In such cases I often found a marked difference between far and near vision (5/50 and Nieden 1 in ciphers and short words).

These patients fix eccentrically at distance, while they use their central rest for near vision (reading). The printed line, which is also seen peripherally, leads them to the lines to be read. It is better to test a patient's central vision, by asking him to read continuous words; this he will not succeed in doing with the central rest. With eccentric fixation, a patient will be able to distinguish only capital letters. Thus, ring scotomas or paracentral scotomas are the cause of the reading disability, the characteristic symptom of nutritional amblyopia.

One of my first patients drew my attention to this. After deciphering 5/35 with difficulty, he was not able to read the next line. He thought it possible, however, to read the smallest symbols on the visual test chart (which fitted the size of his central visual rest) and, in fact, did read them with some hesitation.

Another patient said that he could read newspaper headlines and small print but no normal text.

Vision with the central rest seems to be quite difficult, especially because the period of near adaptation is considerably shortened. As a typical symptom of relative scotoma, this phenomenon is most marked in new cases of amblyopia. Persons who are good observers of themselves describe this short-

Fig. 4 (Obal). The right eye of Dr. W. K., showing a typical ring scotoma about one year after the first blurring of vision. Vision: 5/5, Nieden 1, single ciphers. (---- red; .... green; .-.- blue; absolute scotoma for white, 5/2,000.)

Fig. 5 (Obal). The right eye of F. B., showing an incomplete ring scotoma about two and one-half years after the first blurring of vision. Vision: 5/5, Nieden 1. (White, 2/2,000; .... colors, 10/2,000.)

ened period of near adaptation: "When I have fixed an object for a short time it will suddenly disappear—fade away—and it does not come back until after a little motion of my eyes."

Fig. 6 (Obal). Left eye of F. B. (fig. 5), showing paracentral scotomas about two and one-half years after first blurring of vision. Vision: 5/5, Nieden 1. (White, 2/2,000; .... colors, 10/2,000.)

If there is an improvement, the shape of the central rest, which is at first round, becomes a transverse oval (ellipsoid). At the same time the scotoma is also getting smaller from the periphery.

On further improvement, the ring scotoma breaks up into several nuclear scotomas, beginning toward its nasal part. In this stage of an incomplete ring scotoma, the visual disturbance is already decreased, as well as the photophobia (figs. 5 and 6). A patient can read short words without difficulty and slowly decipher long words. Pres-

Fig. 7 (Obal). The right eye of J. M., showing paracentral scotomas about six years after the first blurring of vision. Vision: 5/5. Nieden 1—partly. (White, 2/2,000; .... colors, 10/2,000; no recognition of green.)

ently, he succeeds in reading continuously, at first printed texts then handwriting, too. Finally, only the paracentral scotoma remains (fig. 7).

These paracentral scotomas, always small, are situated round the point of fixation, with a peripheral limit of about a three-degree radius. Mostly they are connected with each other by a relative central scotoma. If situated beneath or above the point of fixation, these paracentral scotomas are less troubling than when they are on its temporal side. A patient's training and aptitude determine to

what extent he can use his vision in spite of paracentral scotomas.

Color vision

In all my cases of nutritional amblyopia, there were disturbances of color vision. When the color marks were of the same brightness, patients showed the least change in the blue field. It was only slightly or not-at-all constricted. In the red and green fields, constrictions were more distinctly marked. The patients could often see green only on a small nasal part of the visual field; more than half showed an absolute green scotoma. In the most severe cases, there was a red scotoma, too. In only two of 40 cases was blue sensation temporarily impaired.

The central scotomas for colors were, in fresh cases, about 15 degrees in radius. In older cases there were either ring or paracentral scotomas about five degrees in radius.

Patients noticed blurring of their color vision as green and blue merged. A farmer, for example, described the disturbance: "In the early morning, when dew is lying on it, the fresh grass is green, and I can see it. But as soon as the sun comes out, its color is changed to tawny, and I can't see it any longer."

Photophobia is a marked symptom of which most patients complain. They start wearing dark glasses and broad-brimmed hats and avoid staying in bright sunshine. At dawn and night, however, they feel their sight to be nearly normal—a distinct nyctalopia. Examination of dark adaptation with the Auer adaptometer revealed good dark adaptation in these patients. There were no complaints of night-blindness. Only a few patients described temporary reduction in night vision before the manifestation of the gross visual impairment.

General examination

In general, physical examination revealed that my patients did not represent the worst cases of malnutrition. This fact corresponds with the observation that the eye disease became manifest after the general physical condition had begun to improve, when the patients had been living for some time under better conditions.

The nutritional amblyopia seems to be caused especially by a subsequent disturbance of assimilation, which is also evidenced by the appearance of generalized edema and polyneuritic symptoms. As a result of generalized edema, some cases of nutritional amblyopia show a remarkable tendency to deposit fat. This lipodystrophy is called "paradoxical obesity" (Overzier) and is often accompanied by hormonal disturbances, such as gynecomastia, stop of beard growth, lack of libido, and so forth.

Laboratory examination of our patients often revealed diminished blood sugar, probably due to depleted deposits. The normal blood count seemed to be a consequence of the loss of blood serum to the tissues during the stage of generalized edema.

X-ray studies were made in all my patients. They revealed, however, no active, specific pathologic processes in the lungs; no symptoms of tuberculosis.

In the stage of generalized edema, the parotid edema gave the patients a characteristic appearance. This condition seemed to be caused by water retention by the parotid glands (Trautmann and Kanther, 1948).

We seldom saw sinus and tonsil infections in our cases. If they existed, they seemed to have no special relation to the eye disease.

Two patients showed a nerve deafness in connection with other polyneuritic disturbances. Focal infection of the teeth could be excluded. If X-ray studies revealed foci of infection, the affected teeth were extracted. Dental disturbances, however, played a part in the malnutrition. Poor teeth prevented food from being thoroughly chewed, causing a chronic gastritis in some cases.

Changes of nail growth sometimes pointed to the malnutritional origin of the eye disease. In the nails, were transverse furrows

of different sizes and depths. Nail alterations indicated that the general malnutrition which produced the amblyopia was of recent occurrence. Since recent cases of amblyopia respond more readily to treatment than old ones, these changes indicate a better prognosis.

Prognosis

All the authors who observed retrobulbar neuritis in soldiers after World War I (Dinser, 1919; Szymanowski, 1919; and others) point to the poor prognosis in these cases. The central scotoma seldom improved and usually caused permanent working disability.

Similarly, the prognosis in my cases was unfavorable. If blurring of vision had lasted for more than one year the results of treatment were poor. An improvement in the older cases was usually restricted to an enlargement of the color visual field, a greater capacity to distinguish colors, and, if a ring scotoma had been formed, a better function of the small central visual rest.

Training proved an important factor in such cases. Patients can learn to use their visual rest for far and near vision.

In this stage vision depends greatly on the condition of the general health. Systemic diseases can decrease the visual rest and shorten the time of local adaptation for colors.

The prognosis is much better in cases of less than six months' duration. Adequate nutrition could favorably alter the course of the disease. When other symptoms of nutritional deficiency, such as polyneuritic and hormonal disturbances, disappeared, vision gradually improved. In such cases, sometimes even full vision was recovered.

Summary

During the postwar years a markedly increased number of cases of retrobulbar neuritis have been observed in Berlin. The cause seemed to be the preceding period of severe malnutrition.

General symptoms in recent cases were cachexy, lasting diarrhea, generalized edema, polyneuritic symptoms, and such hormonal disturbances as cessation of beard growth, lack of libido, gynecomastia.

Blurring of vision occurs in both eyes simultaneously and to an equal degree. It concerns central vision only to a radius of about five degrees and does not affect the peripheral parts of the retina.

The time necessary for the development of the whole clinical picture of the disease seems to depend on the degree of malnutrition. At first, there are small, negative paracentral scotomas which coalesce within a few days or weeks and make central vision impossible.

In recent cases, vision is always considerably diminished—to 1/10 to 1/20. In this stage is found a relative central scotoma with a radius of about three to five degrees for white and colors.

Some months later, a small central visual rest appears. It is surrounded by a scotomatous region, three to five degrees in radius. A typical ring scotoma is then formed. Under adequate nutritional conditions the central rest shows a good function of 5/4 and Nieden 1.

The disturbances of color sensation which accompany the disease are greatest for green and yellow, less in the red field, while blue sensation is usually not impaired. Furthermore, the period of local adaptation for colors is shortened.

Dark adaptation is seldom affected. On the contrary, because of their photophobia patients like darkness better than light. There is even a typical nyctalopia.

The anterior parts of the eyes remain normal in most cases.

Cases of longer duration usually show a temporal pallor of both discs and a granulation of the macular area.

Prognosis is favorable in recent cases, less favorable in older ones. Paracentral scotomas always remain.

Mansfelder Strasse, 15 (Wilmersdorf).

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RECENT DEVELOPMENTS IN TONOMETRY

Adolph Posner, M.D.
New York

Hjalmar Schiøtz,[1] in 1905, initiated a new era for clinical ophthalmology with the invention of his tonometer. Numerous tonometers had been described before this time, notably the one of Maklakoff[2] and that of Fick,[3] later modified by Lifschitz.[4] The clinical use of all but the Schiøtz tonometer involved technical difficulties which prevented their more widespread popularity.

The tonometers of Maklakoff and of Fick belong to the general group of applanation tonometers. The principle of the applanation tonometer consists in flattening a portion of the corneal curve and measuring either the size of the flattened area corresponding to a constant force or the amount of force needed to flatten an area of definite size. The Souter tonometer, which is still in use, employs the applanation principle.

An impression tonometer, on the other hand, measures the depth of indentation of the cornea produced by a plunger of a given weight. The Schiøtz tonometer is based on the impression principle, except that the indentation is kept within a certain optimal range by permitting the choice of an appropriate weight.

Construction of the Schiøtz tonometer

Essentially, the tonometer consists of a plunger which slides within a cylindrical tube. When the instrument is placed vertically on the eyeball, the plunger indents the cornea. The depth of corneal indentation is a measure of the ocular tension; the greater the indentation, the lower the tension.

The lower surface of the cylindrical tube is concave and serves as a footplate. Its radius of curvature is 15 mm. The lower surface of the plunger is concave, having the same radius of curvature as the footplate. The diameter of the plunger is 3 mm.; that of the footplate, 10 mm.

A lever mechanism magnifies the movement of the plunger 20 times, so that 0.05 mm. of corneal indentation is equivalent to 1.0 mm. on the scale, or one scale division.

The three weights which are used are labelled 5.5, 7.5, and 10, respectively. These numbers represent the actual force, in grams, exerted by the plunger upon the cornea, and not merely the weight of the ballasts themselves.

The entire tonometer including the 5.5 weight should weigh 16.5 gm. These weights

and measurements are important and must be kept standard in order to insure uniformity in the readings obtained.

Standardization and checking of tonometers

Since Schiøtz did not patent his invention, a host of manufacturers soon flooded the market with tonometers sold as "Schiøtz tonometers." Most of these instruments were inaccurately designed and were not made to standard specifications. As the popularity of the Schiøtz tonometer grew, the need for standardization became apparent. Schiøtz,[5] himself, established a checking station in Oslo, and two checking stations were established in Germany by Arnold and Karpow[6] and by Comberg,[7] respectively.

In 1935, the first checking station in this country was established by me[8] at the Herman Knapp Memorial Eye Hospital, but had to be discontinued when the hospital closed its doors in 1939. In 1942, the work of checking and standardizing of tonometers was resumed; this time, with the coöperation of the late Dr. Mark J. Schoenberg and the National Society for the Prevention of Blindness.[9, 10]

A Committee on Standardization of Tonometers, established by the American Academy of Ophthalmology and Otolaryngology in 1942, set up specifications for the manufacture of tonometers.[11] The specifications followed closely the measurements of Schiøtz's original instrument. Certain tolerances, which were not defined in detail by Schiøtz, had to be decided upon by the committee.[12] American manufacturers have shown the utmost coöperation in adhering to these specifications and in submitting their instruments to an impartial laboratory for certification.

Three testing stations for tonometers are now in operation. They are located in New York, Chicago, and San Francisco. The work of these testing stations is limited to the checking and recalibration of tonometers already in use. Now that new certified tonometers are readily available, it is probably wisest to discard tonometers which are in poor condition or which require costly repairing.

If the tonometer does not measure up to the standard specifications, a corrected conversion table is supplied which applies only to that specific instrument. The conversion table is more practical than the graph, as it simplifies the transposition of the readings into millimeters of mercury. The Friedenwald modification of the Schiøtz graph[13] is used as a basis for the conversion tables calculated by the checking stations. The Friedenwald graph is also supplied with all new tonometers of domestic manufacture.

Older modifications of the Schiøtz tonometer

In 1926, Schiøtz,[14] himself, designed a tonometer which differs from his standard one by having a convex instead of a concave surface on the lower end of the plunger. With this so-called "X-tonometer" one is able to measure the entire range of tensions from 10 mm. to 100 mm. without the use of any additional weights.

This is made possible by the circumstance that the area of contact between the plunger and cornea varies with the depth of corneal indentation. Thus, in the case of a hard eyeball, the entire weight of the plunger rests on a small area of cornea, making the force per unit area relatively large. In a soft eyeball, where the corneal identation is greater, a larger area of cornea supports the same plunger weight, thus making the weight per unit area smaller.

The McLean tonometer[15] utilizes partially the principle of the convex plunger, thus making it possible to have a direct reading scale and to use only one weight. The lower surface of its plunger is flat, with rounded edges. The scale is inverted so that it is closer to the eyeball. The McLean tonometer is so calibrated that 40 mm. Hg represents the upper limit of normal tension. Thus, tensions obtained with it are about 10 mm.

Hg higher than those obtained with the Schiøtz tonometer, at least in the critical range.

The Gradle tonometer[16] is built very much like the Schiøtz. It is lighter in weight and is mechanically perhaps more sturdy than the Schiøtz tonometer. The footplate is more deeply curved, having a 7.5 mm. radius of curvature, presumably in order to conform to the curvature of the cornea. Gradle did not take into account the flattening of that section of the cornea which supports the weight of the tonometer. In the past, these tonometers have not given uniform readings. It is expected, however, that this situation will be remedied in the near future, when new, standard and certified Gradle tonometers will be made available.

New tonometers

Recently, several new tonometers have been introduced. Two of these are so designed as to increase the sensitivity of the measurement.

The Harrington tonometer[17] is built to the same specifications as the Schiøtz, but has a large direct-reading clock dial in place of the millimeter scale.

The Mueller electronic tonometer[18] also adheres to the specifications set for the standard Schiøtz instrument. The portion of the instrument which is applied to the cornea is similar to the lower portion of the Schiøtz tonometer. The lever mechanism is omitted, and is replaced by a vacuum-tube amplifier connected by wires to the cylindrical tube of the tonometer. Within the cylinder is an induction coil. The movement of the plunger produces changes in the electrical current passing through the induction coil. These changes are amplified and recorded by a galvanometer which is calibrated to read in terms of the Schiøtz scale.

The chief virtue of the electronic tonometer lies in the absence of friction and in the low center of gravity made possible by the elimination of the superstructure. It should be borne in mind, however, that the intrinsic accuracy of a tonometer is not materially enhanced by enlarging the scale or by introducing elaborate amplifying systems. The tonometer measures only the indentation of the cornea produced by the plunger, the limit of accuracy being approximately one fourth of one Schiøtz scale division, corresponding to 1/80 mm. of corneal indentation.

An improvement in the construction of the Sklar-Schiøtz tonometer was introduced by R. Mehrlust.[18] He designed the hammer with an epicycloid curve and inverted it so that it is convex downward. This assures a uniform magnification ratio and constant perpendicularity of the plunger to the hammer. Thus, it is possible to use a plunger with a flat upper end. By this means, friction is reduced and pitting of the hammer is avoided.

The Berens-Tolman ocular hypertension indicator[19] is an ingeniously designed and greatly simplified version of the Schiøtz tonometer. By noting the relative positions of two hairlines, one is able to determine whether the ocular tension is above or below an arbitrarily set limiting value, for example 25 mm. Hg. Its low cost, the ruggedness of construction, and the simplicity of operation should assure this tonometer widespread popularity.

Interpretation of tonometric readings

The clinical application of the tonometer brings up two important questions: (1) How accurate is the tonometer reading with reference to the diagnosis of glaucoma? (2) What factors influence the reading?

Through numerous manometric measurements, both on living and enucleated human eyes, Schiøtz[5] found that there is no strict correlation between the ocular tension and the intraocular pressure, except for the same eye. Different eyes, when subjected to the same intraocular pressure, as measured by the manometer, may give varying readings on the tonometer.

Even after he discarded the extreme variations, he arrived at a set of three curves for

each weight used—namely, the average, maximum, and minimum curves.[20]

When the 5.5 weight is used, the spread between the maximum and minimum curves is 7 mm. Hg; with a 7.5 weight, the spread becomes 10 mm. Hg; and with a 10 weight, 13 mm. Hg. This means that, when we obtain a reading of 5 with a 7.5 weight, the intraocular pressure is 30 mm. Hg for the *average* eye; but for some eyes, the same reading may indicate a pressure of 25 and, for other eyes, 35 mm. Hg.

This demonstrates the futility of setting strict numerical limits or criteria for the diagnosis of glaucoma. It also shows that the provocative tests should be evaluated with caution and that considerations as to the necessity for surgical intervention should not be based solely on the measurement of ocular tension.

Schiøtz realized that the reason for this variability of readings lies in variations in size and shape of the eyeball, in the rigidity and distensibility of the coats of the eyeball, and in the compressibility of the vascular bed of the choroid. All these factors may be included under the term "ocular rigidity."

To Friedenwald[21] belongs the credit for having analyzed these factors critically, both from the mathematical and from the clinical points of view. He devised tables and graphs, by means of which it becomes possible to determine the roles played by ocular rigidity and intraocular pressure, respectively, in determining the ocular tension.

The method is quite simple. Tension readings are taken with the 5.5-gm. weight and the 10-gm. weight. From the relationship between these two readings, it is possible to estimate the ocular rigidity and, thus, the actual intraocular pressure.

1. If the tensions corresponding to the 5.5- and 10-gm. weights are the same, the ocular rigidity is average and the tension represents the actual intraocular pressure.

2. If the tension obtained with the 10-gm. weight is higher than that obtained with the 5.5-gm. weight, the ocular rigidity is greater than average, and the intraocular pressure is lower than the tension reading.

3. If the tension with the 10-gm. weight is lower than with the 5.5-gm. weight, the ocular rigidity is less than average, and the intraocular pressure is correspondingly higher than the tension reading. In view of the technical errors inherent in the use of the tonometer, Friedenwald[22] voices the warning that too much emphasis should not be placed on a single estimate of ocular rigidity.

As previously mentioned, the graphs supplied with the tonometer are calculated for eyes of average rigidity. Friedenwald's estimation of average rigidity differs slightly from that of Schiøtz. This accounts for a slight discrepancy between their graphs. The Friedenwald graphs[13] have been adopted as standard by the committee. The upper limit of normal for the Friedenwald graph is 28 mm. Hg, while for the latest (1924) Schiøtz[23] graph, it is 30 mm. Hg.

Tonometers purchased prior to 1924 are likely to be accompanied by the older Schiøtz graph (designated as Graph II). The values obtained from this graph are about 4 mm. Hg lower than those of Graph III, setting the upper limit of normal tension at 26 mm. Hg.

These changes in the graphs do not imply any change in the construction of the tonometer. The first tonometer which Schiøtz, built can be used with the newest graph and should give the same scale readings as the latest model of tonometer manufactured.

Technique of tonometry

The patient is placed in a recumbent position, either on a chair or on a couch. Care should be taken that the neck is not constricted. On general principles, it is best to have male patients loosen their neckties and open their collars.

Two drops of a local anesthetic, such as 0.5-percent pontocaine or 2.0-percent holocaine, are instilled in each eye at one-minute intervals. If the patient has had tensions

taken previously, it is advisable to inquire whether there were any allergic reactions to the anesthetic; if such was the case, or if an allergic reaction should develop to pontocaine, one should use holocaine from then on. The eyes are ready for tonometry after two to three minutes.

Meanwhile, the tonometer should be prepared. It is placed firmly on the test block to see whether it registers zero, then the footplate and the bottom of the plunger are wiped with cotton moistened with zephiran (1:1,000).

The patient is instructed to keep both eyes open, to be perfectly relaxed, and to fix an object directly above his eyes: either a mark on the ceiling or the finger of his own hand or that of the assistant's hand.

The lids are retracted gently without causing any discomfort which might produce a reflex contraction of the ocular muscles, nor is any pressure exerted on the eyeball. Even a strong pull on the eyelids tends to increase the intraocular pressure.

The tonometer is placed on the center of the cornea in a vertical position, making sure that the footplate rests squarely on the cornea. If the patient does not look directly upward, the tonometer will have to be tilted a little; such an oblique position of the tonometer results in a somewhat lower tension reading, but the error is not significant.

If the tonometer does not rest squarely on the cornea with its axis passing through the center of the eyeball, the tension reading will also be lower, the error being even greater. Of course, undue pressure on the eyeball raises the tonometric reading.

The tonometer should not be left on the cornea for more than a second or two. The first reading is often higher than the subsequent ones. The applications of the tonometer should be repeated two or three times as quickly as feasible until consistent readings are obtained. These readings may be averaged in estimating the tension. Readings which are completely out of line should be disregarded. It is wrong to take an average of several widely different readings. In glaucomatous eyes the successive tension readings are usually more consistent than in normal eyes.

Unless the tension is expected to be above normal, the 5.5-gm. weight should be used; if the reading is below two scale divisions, the measurement is repeated with the 7.5-gm. weight. Readings should be kept between two and six scale divisions, since this portion of the tonometric graph is the most accurate, subtending as it does, an angle of 45 degrees with the base line. If there is an appreciable oscillation of the pointer, the lowest scale reading should be used.

After the tension has been measured, the eyes should be irrigated with boric acid or physiologic saline solution and the tonometer footplate should be cleaned.

Recording of pertinent data

The tension may be recorded in mm. of Hg by referring to the conversion table. However, if records are to be kept for many years for comparative studies, it is advisable to add also the actual scale reading in the form of a fraction, the weight used being the numerator and the scale reading, the denominator. A reading of, say, three with a 5.5-gm. weight would thus be recorded as 5.5/3. In a case of glaucoma, it is not enough to record the tension. Three other factors should also be stated: the time of day, the number of hours since the last instillation of the miotic, and the kind and strength of the miotic used. Abbreviations or codes may be used for this purpose. The tensions may be recorded in the form of a graph.

Conclusions

The Schiøtz tonometer, invented 45 years ago, has become popular by virtue of its simplicity of construction and ease of operation.

Standardization of the Schiøtz tonometer has been accomplished in the United States largely through the efforts of the Committee on Standardization of Tonometers of the

American Academy of Ophthalmology and Otolaryngology. It is hoped that this work will be extended to other countries in the near future.

Modifications have been introduced from time to time with the object of correcting certain shortcomings in the construction and operation of the original instrument. In evaluating these modifications, one should not lose sight of the fact that there are certain limitations in sensitivity and accuracy which are inherent in the tonometric method.

The tonometer measures ocular tension rather than intraocular pressure. While a correlation between the two exists for the average eye, variations in ocular rigidity play an important role in the interpretation of tonometric readings in many cases.

Careful attention to the technique of tonometry will make for greater accuracy in measurement.

667 Madison Avenue (21).

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THE CHEMO-ANTIBIOTIC THERAPY OF OCULAR TUBERCULOSIS*

GIUSEPPE LEPRI, M.D.
Pisa, Italy

The interest of the present case depends not only on the rapid and brilliant therapeutic result which, of course, was to be expected of drugs having a well-known antituberculous activity, but much more on its clue to the indications, limitations, and possibilities of chemo-antibiotic therapy in ocular tuberculosis.

Chemotherapy of tuberculosis cannot be adopted with equal indications and with equal hope of success in all the pathologic conditions produced by the Koch bacillus. Such a point of view has particular significance in regard to specific ocular alterations among which, in addition to typical clinical tuberculous manifestations with classical anatomicopathologic findings, are found a complex of changes comprehensively defined as atypical expressions of tuberculosis—or paratuberculous forms. These paratuberculous forms of the disease can affect the most diverse structures of the eye, from conjunctiva to cornea, from uvea to retina.

CASE REPORT

History. A woman, aged 60 years, presented clear evidence of general tuberculous infection. In addition to pleuropulmonary residua, the patient had long been suffering, following repeated trauma, from a tuberculous arthritis of the left knee (typical white tumor). The joint had become immobilized, with consequent ankylosis. At the time of this report, however, this condition appeared to have improved.

For several years, the patient had suffered from a chronic iritis in her left eye, with periods of improvement and relapse, which had led to almost complete occlusion and seclusion of the pupil. Two weeks before admission at the clinic, a marked hyperemia of the same eye had become evident. This was accompanied by mild pain.

Eye examination. In addition to the pupillary occlusion and seclusion, a gray, hemispheric nodule was clearly visible on the anterior surface of the iris of the left eye, halfway across the membrane. It jutted out toward the cornea. It was partially covered with a fibrinoid exudate, and its base was surrounded by numerous small vessels. Vision was: 1/50. Ocular tension was normal.

The tuberculin reaction (Mantoux's intradermic test) carried out with 0.01 mg. of Koch's old tuberculin gave:

REACTION	DEGREE
Local	Fairly marked
General	Slight. Maximum temperature (37.2°C.)

It was also possible to observe a certain focal reaction with a slight increase in the size of the nodule and a more accentuated vascularization. Conclusively, the tuberculin test was positive.

Laboratory studies. The serodiagnostic reactions for syphilis were negative. The sedimentation rate showed a net increase: one hour, 16; two hours, 42; six hours, 65; 12 hours, 106.

The clinical diagnosis of isolated nodular tuberculosis of the iris was easily made.

Therapy.† A careful chemo-antibiotic course of therapy was then started: Streptomycin (1.0 gm. daily, intramuscularly, divided into two injections of 0.5 gm. each); paraminosalicylic acid (PAS) (12 gm. daily, 2.0 gm. every four hours); thiosemicarbazone (Tb 1/698 of G. Domagk) (0.1 gm. daily, divided into two doses 12 hours apart).

Course. The second day after therapy was

* From the Eye Clinic of the University of Pisa. Director, Prof. Filippo Caramazza.

† I am indebted to S. A. Farmitalia, of Milan, for the supply of drugs.

initiated, a nodular growth appeared on the conjunctiva, about three or four mm. from the limbus. This growth increased rapidly in size until it reached three mm. in diameter. It had an ulcerated top and clear-cut borders.

In addition to the therapy already outlined, streptomycin was then given subconjunctivally twice a day (0.1 gm. dissolved in 0.5 ml. saline solution and 0.2 ml. of one-percent adrenalin).

After extirpation of the ulcerated conjunctival nodule, an histologic examination (Institute of Pathologic Anatomy) gave the conclusive finding of nodular and diffuse tuberculosis of the conjunctiva.

The chemo-antibiotic therapy, continued alone and without other treatment, resulted in a rapid regression of the swelling and infiltration of the conjunctiva. At the same time, the iris nodule also showed rapid regression. One month later, the granuloma, as well as all other symptoms, had disappeared.

Discussion

Should so rapid and decisive a therapeutic result persuade one to indiscriminate use of such treatment in all ocular affections of certain or suspected tuberculous etiology?

The therapeutic problem is really not so simple. Cautious behavior is indicated—on the one hand, by the knowledge that all morphologic varieties of ocular tuberculosis do not have an etiology of bacteriemic origin; and, on the other hand, by the imperfect knowledge of the antibacterial action of these drugs, all of which are endowed, to a greater or less degree, with bacteriostatic, never decisively bactericidal, action.

The therapeutic direction to be followed must also be debated in the light of the fact that indiscriminate use of such substances may produce the most unfavorable conditions for employing them again in the more or less distant future when the need may be even more immediate. I refer to the well-known phenomenon of the emergence of a bacterial resistance, a phenomenon which I do not overestimate but which certainly has its own importance, particularly in relation to streptomycin.

Unfortunately, it seems that this easily acquired resistance of the Koch bacillus to chemical and antibiotic agents is one of its most typical characteristics. It is well known that, in most cases of ocular tuberculosis, there is a background of general tuberculosis or, at least, a localization, however minimal, of tuberculosis in some other part of the organism. Except for rare cases, ocular tuberculosis is never primary, and we certainly cannot fail to take this fact into consideration when we initiate chemo-antibiotic therapy.

A number of problems confront the ophthalmologist. First of all: In which cases of tuberculous infection should a chemo-antibiotic therapy be practiced without delay and which schemes of administration should be followed?

In addition to the cases which show ocular manifestations in the course of a general, acute disseminated tuberculosis, and in which the ocular therapeutic problem is concomitant with and merged into the general treatment (where chemo-antibiotic therapy must be considered of absolute and urgent necessity), there are other cases in which this specific treatment offers exact indications of promising results.

These cases include infections of the eye and adnexa which are bacteriemic in origin. Among these is the case herein reported, and all similar cases in which exist visible symptoms, macroscopic, biomicroscopic, or ophthalmoscopic, of the most typical of all tissue reactions to the presence of the Koch bacillus—the tubercle.

In regard to the therapeutic regime to be followed in these cases, an essential element to keep in mind is that none of these substances presently available for clinical use*

* Some sulfonamides (promin, sulfone, diasone, promizol, sulfetrone, or sulfonazine) are not mentioned inasmuch as I consider them of minimal therapeutic efficiency, although at first I used some of them (promin, sulfetrone) with streptomycin in experimental and clinical trials.

(streptomycin, PAS, thiosemicarbazone) possess an action completely bactericidal, but in major or minor degrees, are bacteriostatic toward the Koch bacillus. A partial bactericidal mechanism has been recognized only for $Tb_1/698$, on the basis of the morphologic, and even chromophil, alterations which the germ seems to undergo through the action of this drug.

Since this bactericidal action is only minimal, there is outstanding need for simultaneous employment of the three substances in sufficiently high doses so they can attack the tubercle bacillus at different points. This is the therapeutic direction followed in the clinical cases herein reported.

According to my experiences the doses to be prescribed are:

Streptomycin (1.0 gm. daily in two parenteral injections 12 hours apart); PAS (12 to 15 gm. daily, administered in doses of 2.0 to 2.5 gm. every four hours); $Tb_1/698$ (0.1 to 0.2 gm., divided into four doses—one to two tablets of 25 mg., every six hours). Individual tolerance to the last substance must be tested carefully.

When tuberculous manifestations in other parts of the organism co-exist with ocular manifestations of this kind, indicating a moderate, but diffused, bacterial activity, it seems wise to follow the treatment, if possible, until all signs of specific activity, even the slightest, have completely disappeared.

In tuberculous manifestations of the anterior segment, local subconjunctival administration of chemo-antibiotics can—and should—be added to the systemic administration. So far as streptomycin is concerned (the only agent with which I have had considerable experience), its passage inside the anterior chamber could be demonstrated experimentally after this method of administration; it is also apparently well tolerated clinically. The daily subconjunctival injection consists of 0.1 to 0.2 gm. of streptomycin dissolved in 0.5 ml. of saline solution with 0.2 to 0.3 ml. of one-percent adrenalin. Adrenalin tends to keep the antibiotic inside the anterior chamber for a longer time.

The foregoing manifestations do not, however, represent the more frequently encountered clinical forms of ocular tuberculosis. In practice one usually meets with the so-called atypical tuberculosis, a nosologic conception which acquires an ever-greater interest in all fields of tuberculosis, and the importance of which in the ocular pathology need not be underlined.

From conjunctiva to cornea, to sclera, to single portions of the uvea, to retina, to optic nerve—all the sections of the globe may show signs of tuberculous manifestations with atypical characteristics; that is, absence of the Koch bacillus on bacteriologic examination, absence of typical nodules on histologic examination, and negative findings in the biologic tests.

These forms are usually considered to be connected with minimal and transitory bacterial dissemination, as well as (and this seems more probable) with a diffusion of toxins deriving from a latent or active focus of infection. It is clear that these manifestations demonstrate the existence of a state of allergic response, a clinical expression of the ceaseless struggle between the organism and the germ or its metabolic products.

In these paratuberculous conditions, only the employment of the chemo-antibiotic therapy, combined with the desensitizing antitoxin treatment (superior is Koch's old tuberculin in progressively increased doses) and the conventional calcium-vitamin-dietary treatment, can offer sufficient guarantee of success—a success which chemo-antibiotic therapy alone is, perhaps, not able to assure.

For, to date, chemo-antibiotic therapy is only justified in atypical cases, in which treatment is more prolonged, if it is administered in reduced doses (0.5 gm. streptomycin, 8.0 to 10 gm. PAS, 0.05 gm. thiosemicarbazone, daily), over periods of 20 to 30 days, followed by some intervals of suspension. By such a regime, it is endeavored to avoid, particularly in regard to streptomycin, the ever-possible acquisition

of a resistance of the germ to the drugs.

It is only fair to repeat that a rapid and brilliant therapeutic result is more difficult to obtain in atypical cases of tuberculosis, in which the etiologic agent, at least in its typical bacterial expression, is difficult to discover, and consequently to attack without overwhelming the organic resistance.

The limits and possibilities of the chemo-antibiotic treatment of ocular tuberculosis have not, of course, been thoroughly explored in this short analysis. A complete study naturally requires more extensive experience, which I expect to obtain.

SUMMARY

A brilliant therapeutic result in a clinical case of nodular tuberculosis of the iris and conjunctiva, obtained with combined chemo-antibiotic therapy (streptomycin, PAS, and thiosemicarbazone), induced me to consider the possibilities, indications, and limitations of chemo-antibiotic therapy in ocular tuberculosis.

Such treatment is indicated in typical tuberculous forms, characterized by classical clinical and anatomico-pathologic findings. In such conditions, it is necessary to initiate intensive therapy, using an adapted combination of chemo-antibiotic agents.

In all the other so-called paratuberculous forms, wherein a tuberculous etiology cannot be positively demonstrated, treatment should not be confined to chemo-antibiotics alone. Such therapy—at reduced doses—must be an adjunct to the already known procedures, among which is included the general desensitizing antitoxin therapy.

THE LAURENCE-MOON-BIEDL SYNDROME*

REPORT OF A TYPICAL CASE WITH COMPLETE NECROPSY

THEODORE BISLAND, M.D.
Washington, D.C.

The Laurence-Moon-Biedl syndrome has been a diagnostic entity for many years. In 1866, Laurence and Moon[1] reported four cases of retinitis pigmentosa, occurring in the same family, associated with other unusual anomalies, including hypogenitalism, obesity, and mental deficiency.

Earlier, in 1864, Hoerning[2] and (1865) Wecker[3] had described cases of retinitis pigmentosa with polydactylism but had not called attention to the possible existence of a new syndrome. In 1920, when Bardet[3] reported an isolated case of polydactyly, adiposogenitalism, and retinitis pigmentosa, the symptom complex came to be recognized as a disease entity.

Biedl,[4] in 1922, reported two cases in one family and he considered that the syndrome in its complete form would include any of such congenital malformations as polydactylism, retinitis pigmentosa, skull deformities, and atresia ani, as well as mental deficiency, obesity, hypogenitalism, and digestive disturbances.

The five cardinal symptoms are: mental deficiency, pigmentary degeneration of the retina, hypogenitalism, obesity, and polydactylism. Familial occurrence and hereditary factors have been extensively studied by Nettleship, Ursher, Bell[2] and by Cockayne and others.[22]

Concomitant anomalies listed by various authors include nystagmus, microphthalmos, strabismus, myopia, posterior polar cataracts, deafness, congenital heart disease, bilateral genu valgum, bilateral hydronephro-

* From the Hospital das Clinicas, São Paulo, Brazil. Presented in part before the Sociedade de Oftalmologia de São Paulo, São Paulo, Brazil, May, 1949.

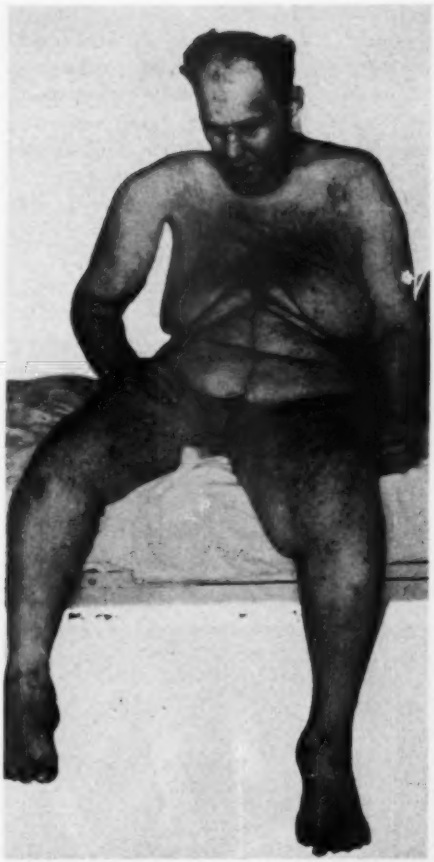

Fig. 1 (Bisland). Note the large pendulous breasts, the thoracic hair, and the baldness. The thighs are huge, and each foot has six toes.

sis, hypospadias, disseminated sclerosis, hypothyroidism, diabetes insipidus, decreased carbohydrate tolerance, dwarfism, and tetany.[2, 5, 6, 11, 12, 17, 26, 43] Marmor and Lambert[23] emphasize, however, that all of the cardinal signs are not necessary to a presumptive diagnosis, the most important ones being obesity, genital dystrophy, and retinitis pigmentosa.

The Laurence-Moon-Biedl syndrome, while composing a distinct disease entity, is not common. According to Radner,[7] about 200 cases had been reported to 1940, but Schwartz and Boudreau[8] list only 129 to the middle of that year.

Review of the literature from 1940 to the present shows only 68 additional different cases, thus bringing the total (accepting Radner's figures) to around 270 reported cases. Of this total, two cases were in the Caucasian and three cases in the Negro races.[11, 13, 28]

Instances of the complete syndrome are only a fraction of the total reported cases. Reilly and Lisser,[10] reviewing the known cases in 1933, found the complete syndrome in only 25 of 77 cases. Of the 102 patients on whom data were tabulated by Warkany and others[11] in 1937, only 24 exhibited the complete syndrome. This last figure, when expressed in percent (about 20 percent), is probably more representative of the present status of the literature.

The anatomicopathologic documentation of such cases is extremely rare—only six necropsies being reported in the world literature. The first was reported in 1936 by Van Bogaert and Borremans.[9] The others were reported by Loepp later in 1936,[19] by Griffiths in 1938,[20] and by Riggs[21] (two cases) in 1939. These five cases were collected, reviewed, and summarized by Ander-

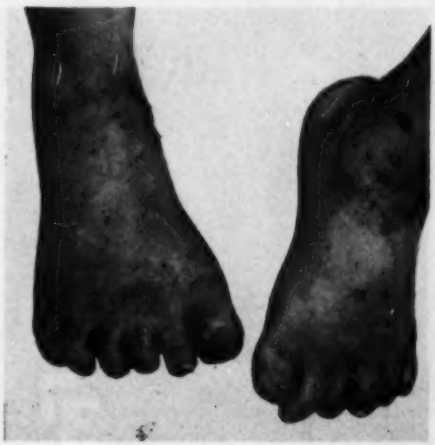

Fig. 2 (Bisland). Close-up of the feet, showing the six toes on each foot.

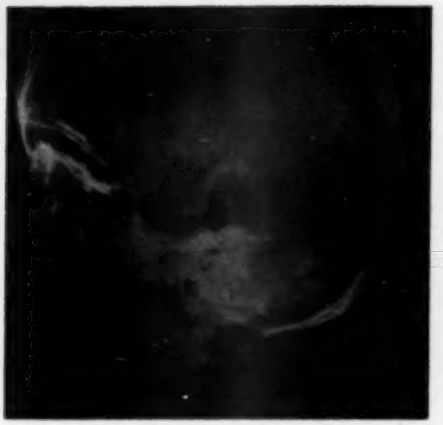

Fig. 3 (Bisland). A lateral skull plate, showing large frontal sinuses and a rather small pituitary fossa.

son[12] in 1941, who added an additional case report and necropsy which was the sixth.

Since the work by Anderson, there has not been another reported autopsy. Of the six necropsies collected by him, two were poorly and incompletely done with only partial gross examinations and no histologic examinations. Of the remaining four cases, only two showed the complete syndrome, and sections of the hypophysis were taken in only two of the four. No sections of the eyes were examined and reported in any of the six cases that came to necropsy.

The major task of explaining the etiology of the Laurence-Moon-Biedl syndrome has been willingly undertaken by the geneticists and endocrinologists—Biedl,[4] Raab,[14] Ornsteen,[15] Jenkins and Poncher,[18] Cockayne, et al.,[23] Warkany, et al.,[11] Hecker and Warren,[22] Radner,[7] Marques,[24, 25] Ellis and Law,[27] McCullagh and Ryan,[5] Anderson,[12] Lurie and Levy,[16] Jaso and Curbelo,[28] De Finis and Nogueira.[6] Burns[42] has contributed a midcentury report that is quite thorough.

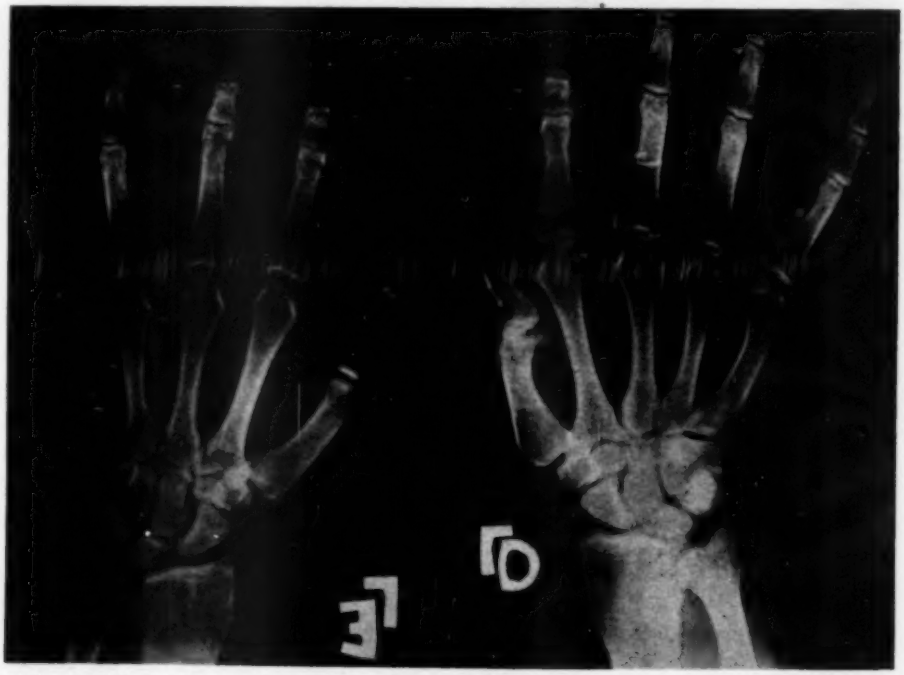

Fig. 4 (Bisland). The hands are rather pudgy. There is a small bony eminence on each thumb which probably represents the old articulation or union with amputated digits.

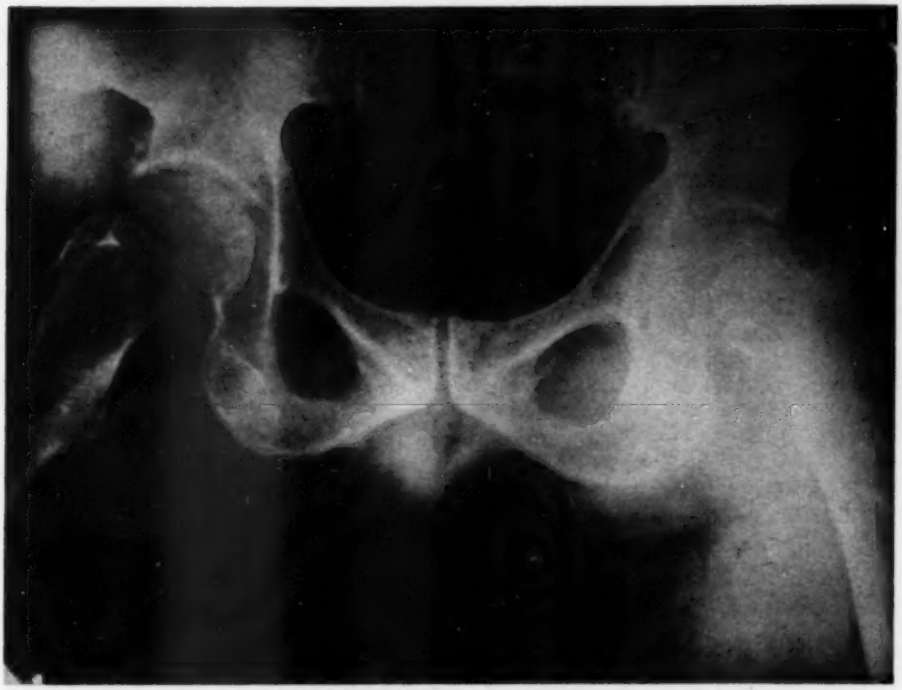

Fig. 5 (Bisland). An anteroposterior film, showing the android pelvis with decalcification, moth-eaten pubic bones, and questionable deformity of left femur head.

It is interesting to note that the father of the patient of De Finis and Nogueira stated that, in his home town of Dalvarez, Portugal, he had known of many cases of extranumerary digits, although there had been none in his family.

In general, these authors seem to believe that the mental deficiency is of primary importance and a result of defective germ plasm, other changes being secondary through involvement of the hypothalamus and, indirectly, the pituitary, though polydactilism and/or other skeletal defects are considered to be primary manifestations of the defective germ plasm.

It is not the purpose of this paper, nor within its scope, to discuss fully the history, clinical manifestations, or fundus picture of this disease entity. However, the night blindness and progressive limitation of the visual fields are well-known characteristic symptoms. The fundus typically presents attenuation of the vessels and pigmentary changes with "bone-corpuscle" tasselation.

It has been brought out by Cockayne,[23] Sorsby,[24, 31, 32] Ellis and Law,[27] Lyle,[30] Taylor[29] that the range of fundus lesions extends to at least four variants of tapetoretinal degeneration—typical retinitis pigmentosa, atypical retinitis pigmentosa, macular dystrophy, and atypical retinitis pigmentosa combined with macular dystrophy. The characteristic of the visual field is an early ring-shaped or annular scotoma which progressively enlarges anteriorly and posteriorly concomitantly with the degenerated zone of the retina.

Elaboration on treatment is also beyond the scope of the present communication. Suffice it to say that practically everything has been attempted at one time or another. The mental retardation has been attacked

Fig. 6 (Bisland). An anteroposterior film of the left leg, showing the genu varum and posterior displacement of the fibula.

through specialized sociopsychologic approaches[16] and hormonal administration.[5, 6] The obesity and hypogenitalism have also been attacked with hormones.[2, 5, 6, 13]

With regard to the fundus lesions, efforts at vasodilatation by one means or another have been most favored.[2] Hormonal therapy, liver extracts, placental implantations, and other methods have been tried.[2, 5, 6, 37, 41] Valuable papers and reviews along this line have been written by Gordon[36] and Saltzman and Haig.[37] The recent introduction of the Beck operation[38] offers a further mode of attack on the retinal and cerebral manifestations. Gordon and McLean[44] have made a preliminary report on the use of ACTH.

Report of a case

A. U., an unmarried white man, aged 48 years, was admitted to the emergency ward of the Hospital das Clinicas, São Paulo, Brazil, on March 23, 1949, after he had fallen down a flight of stairs at home and struck his head.

History. The patient's brother said that the injured man had not been feeling well for 10 days prior to admission, that he had not been eating well, and that his general condition had worsened perceptibly.

The patient was of low intelligence. As a child, he had had two extra digits amputated, one arising from the lateral aspect of each hand. His sight had been poor for 30 years, he had not gone out of the house for 25 years, and had been completely blind for 20 years. There was no history of polyuria, pyuria, or dysuria. The patient had never worked.

Family history. There was no history of consanguinity. Of the four siblings, two were male and two female. With the exception of one sister who was deaf, all members of the family were reported as normal. No other member was blind, excessively obese, or had an excessive number of digits.

Physical examination revealed an extremely obese white man whose weight was 310 pounds (142 kilos). There was excessive panniculus adiposus at the level of the trunk and of the proximal aspects of the extremities (fig. 1). Breasts and abdomen were pendulous.

Although the patient's voice was fairly deep, his responses were so loud that, in spite of a negative history, there appeared to be a hearing difficulty. There was beginning baldness, and rather coarse pubic hair was distributed in a normal male fashion. The penis was rudimentary, measuring only three cm. in length. Two testicles, the size of olives, were contained in a small scrotum. The rectal examination was noncontributory.

On each foot, there were six apparently normal toes (fig. 2). Genu varum was quite obvious.

Laboratory. R.B.C., 3,200,000; W.B.C., 12,200. Urinalysis: specific gravity, 1.0/0; albumen, one plus; no sugar; no acetone. Blood sugar, 147 mg. percent.

Eye examination showed the extraocular muscles to be intact. The pupils, five mm. in diameter, were equal and round but did not react to light. Accommodation could not be obtained. Atropine produced a mydriasis of eight mm. Ophthalmoscopic examination revealed a bilateral lens opacity which made visualization of the fundus impossible.

X-ray examination. All films showed marked decalicification of the osseous structures. There were no fractures of the skull (fig. 3) but large frontal sinuses and a small pituitary fossa. The hands (fig. 4) showed a bony eminence, immediately under the sites of the lateral thumb scars, which probably represented the old articulations or union with the amputated digits.

The pelvis (fig. 5) presented moth-eaten edges and marked decalcification. Its outlet was android in type (the transition form between male [anthropoid] and female [gynecoid]). The head of the left femur showed an enlargement that might have represented a congenital deformity.

The knee joints (fig. 6) showed general decalcification, marked genu varum, and displacement of the fibula posteriorly so that the fibula was super-

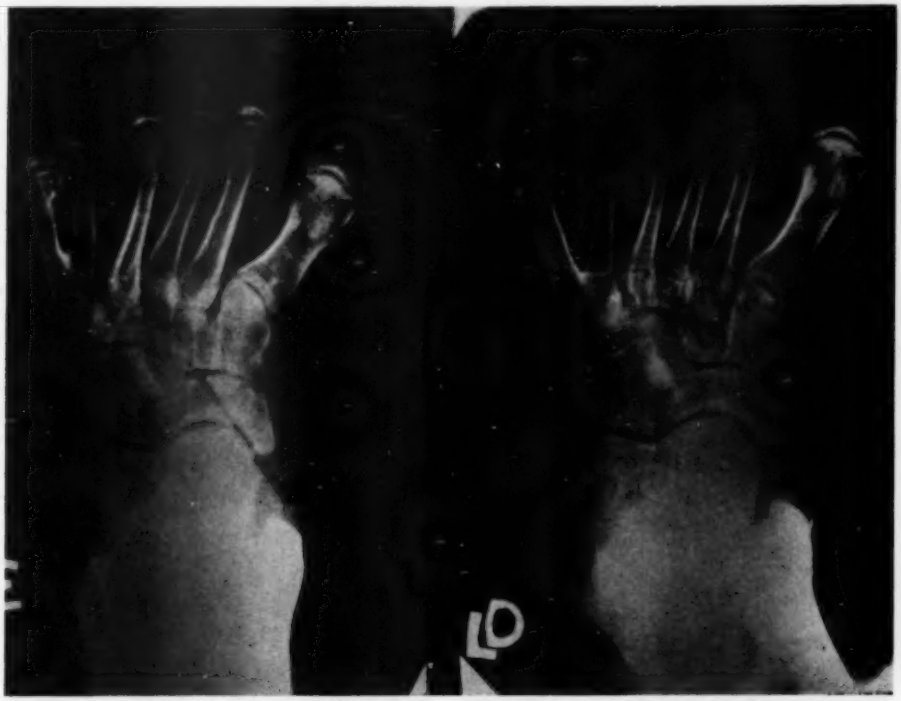

Fig. 7 (Bisland). X-ray film of the feet, showing the six toes and the syndactyly.

imposed on the tibia. There was evidence of dysplasia of the upper medial tibial epiphysis which could have been due to a congenital condition, to rickets, or to osteomalacia.

On each foot (fig. 7) there were six toes with three carpal bones in each toe. The two lateral toes showed varying degrees of syndactyly.

Course. Although the X-ray films of the skull showed no fracture, the morning after admission the patient had an epilepticlike seizure, entered into coma, failed to respond to treatment, and died that afternoon.

Necropsy findings

Gross

Head. A transverse, five-cm. scalp laceration in the parieto-occipital region had been sutured. There was no evidence of fracture. The brain weighed 1,425 gm. and was normal in volume and form. The leptomeninges showed hemorrhagic suffusion, five to six cm. in diameter, of the subarachnoid space at the level of the convex face of the left parietal lobe. The vessels were congested; the arteries showed sclerotic plaques.

The convolutions and sulci were unremarkable. Frontal brain cuts showed nothing of note. The sella turcica and hypophysis were without gross alterations.

Diagnosis. Hemorrhagic suffusion of the leptomeninges, congestion, arteriosclerosis.

Eyes. No gross anomalies were noted. Both were placed in formalin. Upon opening later, the fundus showed a tassellated appearance, with gray bone-corpuscle clumps on a black background.

The lungs showed emphysema and slight edema. The heart showed hypertrophy of the left ventricle. Stomach, intestines, and pancreas were grossly unremarkable. The liver appeared fatty; spleen slightly enlarged.

Kidneys. The right kidney weighed 45 gm.; the left, 55 gm. (normal, 150 gm.).

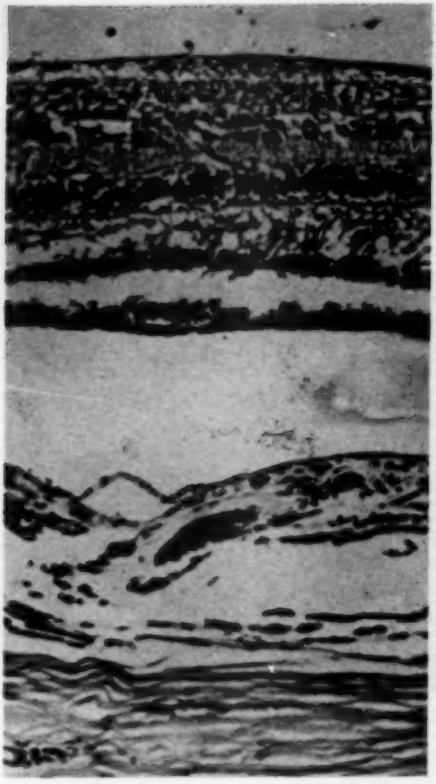

Fig. 8 (Bisland). Section of the retina, showing only minimal changes (×54).

They were of normal form and firm consistency. The capsule was removed with difficulty, leaving a granular surface. There was irregular narrowing of the cortex which was poorly delineated and showed thickening of the larger vessels. The medulla, calycles, and pelvis, as well as bladder and ureters, were unremarkable. The adrenal glands, grossly, were unremarkable.

MICROSCOPIC

The most remarkable lesions were found in the kidney, liver, pituitary, testicles, and eye.

Kidney. A moderately large portion of the glomeruli were partially or completely changed into hyalin masses. Some tubules were atrophic. The amount of connective tissue between the tubules and glomeruli showed a relative increase. Some of the medium-sized and small arteries showed intimal and medial proliferation and thickening. The changes were consistent with chronic nephritis.

Pituitary. A cell count showed: Basophils,

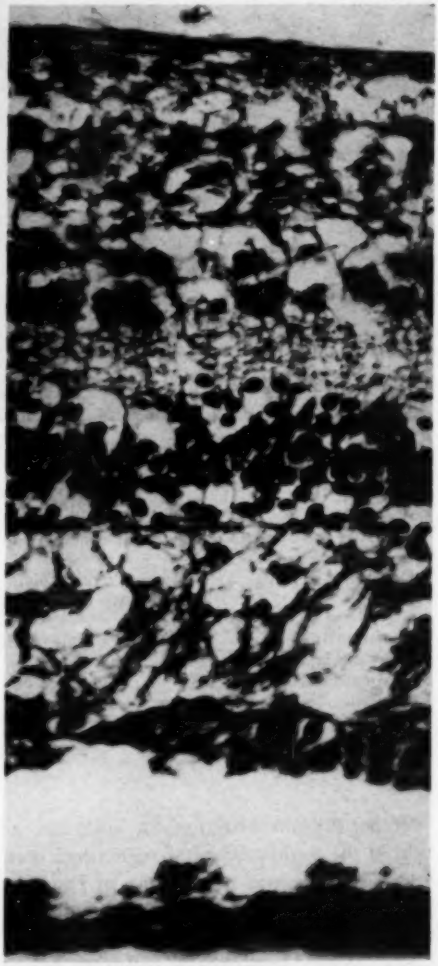

Fig. 9 (Bisland). High-power view of Figure 8 (×180).

40 percent; acidophils, 33 percent; chromophobes, 27 percent.

Testicle. All sections showed moderate interstitial fibrosis and decrease in the interstitial cells of Leydig. The left testicle had a five-mm. tumor mass which showed a papillary type of proliferation of some of the tubules and dense connective-tissue stroma.

Eyes. Posterior cataractous changes were noted in both eyes. Retinal sections showed pathologic processes of varying degrees.

Figures 8 and 9 show perivascular infiltration of the sclera with pigment cells. The retina of this section shows only small changes—reduction of the cells in the internal nuclear layer as well as in the rod and cone layer. There is some sclerosis of the vessels in the choroid.

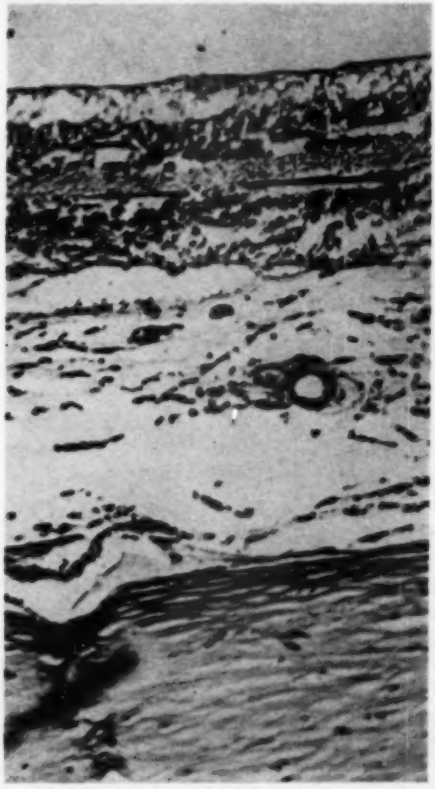

Fig. 10 (Bisland). Section showing more marked changes in the various retinal structures. There is moderate postmortem autolysis here (×54).

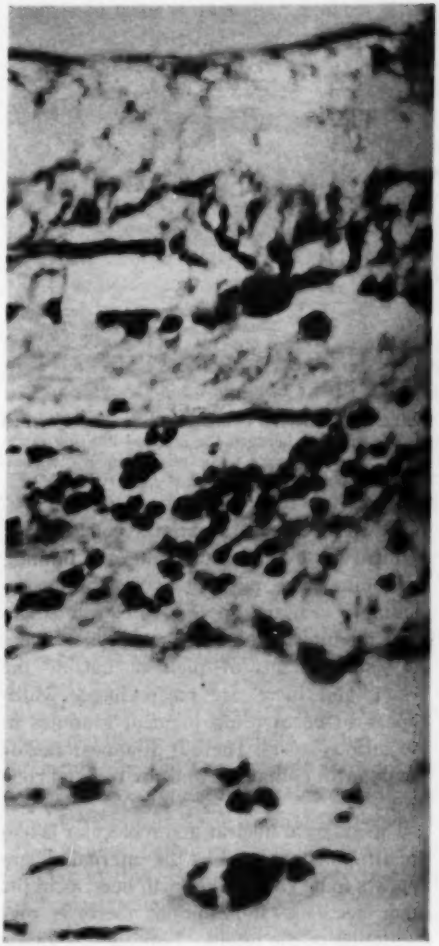

Fig. 11 (Bisland). High-power view of Figure 10 (×180).

Figures 10 and 11 show disappearance of the pigment epithelium, disappearance of the rod and cone layer, and reduction in the number of cells of the other layers. Only postmortem changes are present in the external nuclear layer.

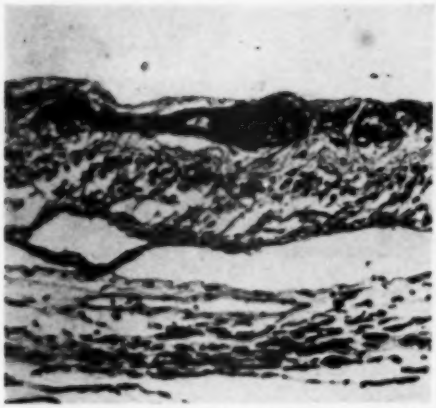

Fig. 12 (Bisland). Section showing the collection of pigment just beneath the internal limiting membrane, which appears to be pushed up by the collection of pigment.

Figures 12 and 13 show a collection of pigment just under the internal limiting membrane. The pigment is apparently occluding a vein and appears to elevate somewhat the internal limiting membrane. There are small clumps of pigment outside the vessel, and there are macrophages which appear to be carrying pigment granules in the various layers. There is disappearance of the pigment epithelium and the rod and cone layer.

The external nuclear and molecular layers are atrophied, as well as the internal. There appears to be glial overgrowth here, as in the other sections. In addition, there is pigmentation of the internal limiting membrane and of the nerve-fiber layer.

Diagnosis. A section sent to the Laboratory of Eye Pathology, Massachusetts Eye and Ear Infirmary, received the following diagnosis:

Advanced vascular sclerotic disease of the uvea. Atrophy and pigmentary retinitis of the retina. Atrophy of the optic nerve. Laurence-Moon-Biedl syndrome.

Comment

This case of the complete Laurence-Moon-Biedl syndrome has several features worthy of comment. Although it is the seventh case with necropsy findings to be reported, it is the first, to my knowledge, to be accompanied by ocular sections.

Among other things, it is interesting to note that the patient was becoming bald (fig. 1), that he had a beard and masculine pubic hair distribution, and a moderately deep voice. Since it is well known that eunuchs never become bald, it would appear that this patient was producing the male sex hormone in quantities sufficient to cause the alopecia.[45] The small penis was probably a manifesta-

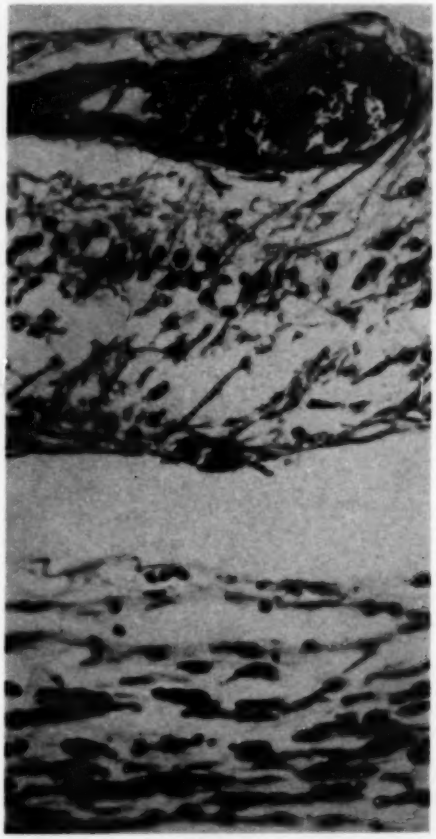

Fig. 13 (Bisland). High-power view of Figure 12. Note how the pigment appears to be occluding the vessel. Many macrophages in the various layers appear to be carrying pigment granules (×180).

tion of inherent germ-plasm deficiency; hence, although the stimulus (androgen) was present, the end-organ failed to respond.

The generalized decalcification is also interesting. Unfortunately, it was impossible to obtain more blood studies, such as nitrogen retention, calcium, and phosphorus, because of the unexpectedly rapid death of the patient. Whether the marked decalcification was due to his renal disease or was part of the many variations of the Laurence-Moon-Biedl syndrome cannot be answered. The presence of normal blood pressure and absence of retinal hemorrhages would seem to argue against nephritis as the sole cause, however.

X-ray films of the feet show that, although apparently the patient had six normal toes, the lateral two toes on each foot were united so as to place this case into the category of syndactyly. The android pelvis and the dysplasia of the tibial epiphyses have been mentioned.

The cause of death is still uncertain. It is true that the patient had suffered a fall and had been feeling badly with digestive symptoms for some days. The necropsy findings on the other hand were not considered to account fully for death. This has apparently been the case in the majority of incidences.[12, 20, 21]

It has been noted by some authors that, in the Laurence-Moon-Biedl families, there were less viable siblings[20, 29] who either were still-births or died soon after birth. In all of the previously reported cases that came to necropsy[12] the patients were under the age of 40 years. Trauma and vicissitudes that would not concern the average person may be sufficient to prove fatal in these cases.

It is of value to note that, in three out of five reasonably complete autopsies (including the present one), a significant involvement of the urinary system, either in the form of chronic glomerulonephritis[21] or hydronephrosis[12] was demonstrated. The findings in the pituitary are similar to those previously described.[12]

The ocular findings in this case of Laurence-Moon-Biedl syndrome are in accord with the reports by Friedenwald[40] and Verhoeff[39] of typical cases of retinitis pigmentosa. What causes the vessel attenuation, and the degeneration of the rods and cones is unknown. Once the pigment becomes free and passes through the external limiting membrane, however, the intercellular fluid currents carry the phagocytosed pigment upward to the perivascular exit channels, and hence the collection of pigment around the veins in the area of the internal limiting membrane.

Summary

A report, with complete necropsy findings, of a typical case of the Laurence-Moon-Biedl syndrome has been presented. This is the seventh necropsy report in the world literature, the third on patients showing the complete syndrome, and the first with accompanying pathologic reports of the eyes. The ocular pathology was found to be similar to that reported previously in cases of typical retinitis pigmentosa.

Gallinger Municipal Hospital.

I wish to extend my appreciation to Dr. Primocurti, Dr. Bittencourt, Dr. R. Montenegro, Dr. Plinio de Toledo Piza, and Dr. Cyro de Barros Rezende, as well as to the staff of the Hospital das Clinicas, São Paulo, Brazil, for their unstinting assistance and coöperation.

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Ophthalmic Miniature

"Thence with my Lord (Brouncker) to his coach house and there put in his six horses into his coach, and he and I alone to Highgate. All the way coming and going I learning of him the principles of Optics, and what it is that makes an object seem less or bigger and how much distance do lessen an object and that it is not the eye at all, or any rule of optics, that can tell distance, but it is only an act of reason comparing of one mark with another, which did both please and inform me mightily."

Pepys' Diary, July 1666.

NOTES, CASES, INSTRUMENTS

EFFECT OF CORTISONE ON EXPERIMENTAL HERPES-SIMPLEX KERATITIS OF THE RABBIT*

PHILLIPS THYGESON, M.D.,
HILDEGARD O. GELLER, M.S., AND
ARIAH SCHWARTZ, M.D.
San Francisco, California

ACTH and cortisone have proved to be remarkably effective in a wide variety of inflammatory diseases of the external and inner eye. Observations to this effect have been reported by Gordon and McLean,[1] Olson and co-workers,[2] Woods,[3] Steffensen and co-workers,[4] Henderson and Hollenhorst,[5] von Sallmann,[6] McLean,[7] Lippmann,[8] Koff and co-workers,[9] Rome and Koff,[10] Hogan and co-workers,[11] and Mazar and Bogdasarian.[12]

The results seem to have been most striking in acute, self-limited diseases, such as nongranulomatous uveitis, and in sympathetic ophthalmia, vernal catarrh, and so forth, in which a hypersensitivity factor is prominent. There is, as yet, no example of therapeutic success in any bacterial or viral disease in which the allergy-of-infection factor is minimal or lacking.

Perhaps the most dramatic effect has been obtained in phlyctenular keratoconjunctivitis in which Thygeson and Fritz[13] reported relief of acute attacks in from 24 to 48 hours after subconjunctival or topical administration of cortisone.

On the other hand, ACTH administered by Coriell and co-workers[14] to 35 patients with poliomyelitis, in which the sensitivity factor seems to be minimal or absent, failed to modify the course of the disease.

Dendritic keratitis is a specific corneal disease due to herpes-simplex virus and there is, at present, no evidence to suggest that hypersensitivity plays an important role in its clinical course. The existence of a specific skin reaction establishes the fact that hypersensitivity does occur in this disease, however, and isolated reports of beneficial effects from cortisone by McLean[7] and others[6] suggested the desirability of testing the value of the drug systemically and topically in experimental herpetic keratitis of the rabbit.

Materials. Cortisone acetate (Cortone, Merck), designed for intramuscular use, was available for this study. It was used undiluted for intramusclar and subconjunctival injection, and diluted with normal saline 1:2 or 1:3 for topical instillations. The rabbits were adult albinos.

Two of the strains of herpes-simplex virus (Duffy and Peterson) had been isolated recently from typical cases of dendritic keratitis in the eye clinic of the University of California Medical School; the third strain (Maxwell) was isolated from a skin vesicle by the department of dermatology.

Experiment 1. The corneas of both eyes of two rabbits were inoculated with the Duffy strain of herpes-simplex virus. Three days later, typical keratoconjunctivitis had developed in all four eyes. One rabbit was then given 20 mg. of cortisone intramuscularly daily. The animal died in five days (on the eighth day after inoculation with virus) from encephalitis, with no sign of modification of the keratoconjunctivitis. The untreated control animal, with mild keratoconjunctivitis, died from encephalitis on the 13th day after inoculation.

In this experiment the disease in the eye of the animal treated with cortisone intramuscularly was more severe than the disease in the eye of the control.

Experiment 2. The corneas of both eyes of two rabbits were inoculated with the Duffy strain of herpes-simplex virus at 2:30 p.m. The following morning, and daily thereafter

* From the Francis I. Proctor Foundation for Research in Ophthalmology, Division of Ophthalmology, University of California Medical School. This work was supported by a grant from The Gustavus and Louise Pfeiffer Research Foundation.

for five days, one rabbit received 20 mg. of cortisone intramuscularly. The first signs of infection were noted in both treated and control rabbits on the third day, and on the sixth day the eyes of both animals showed typical herptic keratitis of equal intensity. The treated animal died on the 10th day after inoculation and the control animal on the 16th day, both from encephalitis.

In this experiment the disease was not modified by intramuscular cortisone therapy.

Experiment 3. The corneas of the left eyes of two rabbits were inoculated with the Maxwell strain of herpes-simplex virus. The following day the inoculated eye of one rabbit was treated by conjunctival instillations of cortisone, diluted 1:2 with normal saline, at hourly intervals for a total of nine times during the day. This treatment was continued until the animal was killed on the 13th day.

The eye of the control rabbit first showed definite signs of infection on the fifth day; the eye of the treated rabbit showed a keratitis of indefinite onset which first became severe on the 11th day.

The control animal showed severe encephalitis on the eighth day and was killed; in the left eye there was a central corneal opacity. The treated animal was badly paralyzed on the 13th day and was killed; its left eye showed somewhat less opacification than the control eye.

In this experiment the infection in the eye treated topically with cortisone had a delayed onset and was somewhat less severe than that in the untreated eye.

Experiment 4. Herpes-simplex virus of the Maxwell strain was inoculated into the corneas of the right eyes of two rabbits. One day later one rabbit was given 0.1 cc. (2.5 mg.) of cortisone subconjunctivally. At the same time cortisone diluted 1:2 with normal saline was instilled into the inoculated eye, and this treatment was continued at hourly intervals during the working day throughout the course of the experiment.

Both treated and control eyes developed typical keratoconjunctivitis after a three-day incubation period. The subconjunctival injection was repeated on the fourth day.

The treated animal became badly paralyzed from encephalitis on the eighth day and was killed; the treated eye showed a very severe infection. The control rabbit had a milder keratitis and developed a mild encephalitis. It was killed six weeks after inoculation and at that time showed a mild corneal opacification.

In this experiment the keratitis and encephalitis in the rabbit treated by subconjunctival injections and instillations of cortisone were more severe than they were in the control rabbit.

Experiment 5. Both corneas of a single rabbit were inoculated by the corneal scratch method with the Peterson strain of herpes-simplex virus. The right eye showed a typical clinical herpetic keratitis, fully established by the fourth day; the left reacted with an unusually mild infection of slow onset which did not reach full intensity until the 12th day.

The right eye was treated on the fourth day by subconjunctival injection of 0.1 cc. of cortisone acetate near the limbus. This was repeated daily for six days without affecting the keratitis.

On the 11th day after inoculation with virus, the right cornea showed three typical dendritic figures and the untreated left eye showed one. On the 17th day the disease in both eyes had become inactive but the right cornea showed more extensive scarring than the left.

Both corneas of a single control rabbit were inoculated with the same virus strain at the same time and with the same technique. The rabbit developed a typical keratitis in the right eye which ran the usual course to healing in about 18 days. The intensity and clinical course of the disease was approximately the same as in the treated eye of the first rabbit. The left eye of this control rabbit failed to develop clinical disease.

In this experiment cortisone given daily by subconjunctival injection near the limbus after clinical disease had been established failed to modify the keratitis.

Experiment 6. Both corneas of a single rabbit were inoculated by the scratch method with the Peterson strain of virus. A typical herpetic keratitis was established in the right eye by the fourth day. The left eye showed no sign of infection. A subconjunctival injection of 0.1 cc. of cortisone was given near the limbus on the fourth day and was repeated on the sixth and eighth days.

On the tenth day there was a very severe keratitis with considerable exudate. Encephalitis also developed and the animal had to be killed.

The disease in this experiment was obviously not modified by subconjunctival injections of cortisone begun on the fourth day after inoculation.

Experiment 7. Both corneas of a single rabbit were inoculated with the Peterson strain of herpes-simplex virus. The following day the right eye was treated with 0.1 cc. of cortisone injected subconjunctivally on the bulbar conjunctiva, and with instillations of cortisone diluted 1:3 with normal saline hourly during the day. The subconjunctival injection was repeated every other day.

The keratitis began simultaneously in both eyes and ran almost identical courses. Encephalitis developed on the eighth day and the animal was killed.

In this experiment cortisone used both subconjunctivally and topically failed to influence the course of the experimental disease.

Summary and Conclusions

Experimental herpes-simplex virus keratitis in the rabbit produced by three strains of virus in a series of seven experiments failed to respond to cortisone administered intramuscularly, subconjunctivally, or by instillation into the conjunctival sac.

In only one of the seven experiments was the disease in the treated eye less severe than the disease in the control eye; in the remaining six it was of identical or greater intensity in the treated eyes than in the control eyes.

In view of the effectiveness of cortisone in diseases in which hypersensitivity is a prominent factor, this result would suggest that hypersensitivity is an unimportant factor in this disease.

The Medical Center (22).

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HYPOPLASIA OF THE OPTIC NERVE*

DAVID C. BOYCE, M.D.
Grand Rapids, Michigan

It was our good fortune several months ago to have in this clinic a case of a rare congenital anomaly, hypoplasia of the optic nerve. The patient was a two-year-old white boy who, according to his parents, had been blind since birth. His mother's pregnancy was uneventful, and he was apparently a normal term baby. The family history was negative concerning a similar eye anomaly. An older brother was completely normal.

Upon general examination, it was found that he was of normal weight and height for his age. No neurologic or other abnormality was noted.

The eyes were of normal size. Their movements were purposeless and a lateral and somewhat rotational nystagmus was present. The child did not respond to any visual stimulus. The anterior segments were normal. The pupils were three mm., round, and no reaction to light could be elicited. The ocular tension as judged by finger palpation (which is not too dependable in children, of course) was normal in each eye.

Examination under anesthesia revealed no abnormality of the lens or vitreous. Each nervehead, however, was found to be about one third the normal size, and each was somewhat pale temporally. The vessels emerged from the discs in normal fashion, but thereafter they became somewhat tortuous (fig. 1). Otherwise, no abnormality of the fundi

* From the Department of Ophthalmology, State University of Iowa Hospitals, Iowa City, Iowa.

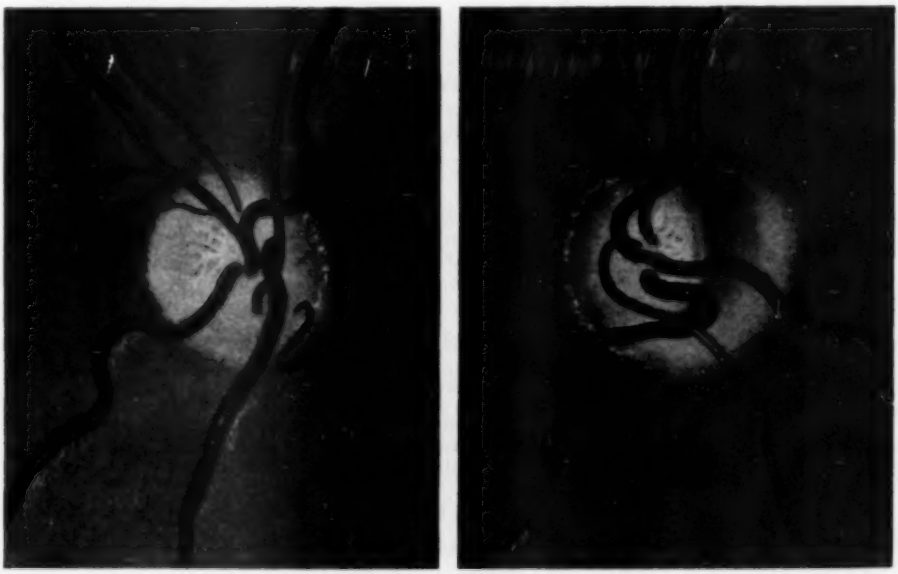

Fig. 1 (Boyce). Hypoplasia of the optic nerves. (Photograph of a drawing by Lee Allen.)

was noted. The refractive error, as judged by the ophthalmoscope, was a moderate myopia.

This case is very similar to one reported in 1941 by Scheie and Adler.[1] Their patient, a three-year-old boy, was normal in every respect except for his eyes. These were normal except for hypoplasia of the optic nerves, the description of which is almost identical to our case.

Previous to their case report, Scheie and Adler could find only five cases of hypoplasia of the optic nerve in man in the literature. There have been several reports of such anomalies in lower animals.

An explanation of this anomaly of the nerve was offered by Scheie and Adler, the epitome of which follows: As you recall, after the optic vesicle is formed (four-mm. stage), the fetal fissure develops (4.5 mm. stage). This runs ventrolaterally from the front of the vesicle to the optic stalk.

Simultaneously mesoderm with primitive blood channels invades the fetal fissure, and the vessels later form the hyaloid vascular system. Later on (17-mm. stage), after the inner layer of the optic vesicle has developed and cell types have become differentiated, the ganglion cells are formed. Their axons pass out through the papilla and the optic stalk.

It was reasoned that the probable initial failure of the ganglion cells, and thus of their axons, resulted in the lack of development of the papilla. Although this has not been confirmed by histologic sections in man, a similar-appearing nervehead in a cat was found to be due to just this cause, as recorded by Szymanski in 1926.[2] It is quite probable that this is a likely explanation for the anomaly in man.

It has been further hypothesized that, if the mesodermal elements had not entered the fetal fissure in time, it would have closed over, leaving no papilla at all. Cases of this nature have been reported by Krause and Retze (as cited by Scheie and Adler).

A case midway between this extreme and that of hypoplasia was reported by Ridley.[2] The nerveheads in this patient were very small and cupped. A few threadlike vessels were seen emerging from the discs, but only one of these appeared to contain blood.

110 Fulton Street, East (2).

I wish to acknowledge the help of Dr. Otis S. Lee and Mr. Lee Allen in preparing this case report.

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STREPTOMYCIN IN EALES'S DISEASE

PETER SYKOWSKI, M.D.
Schenectady, New York

Recently, Woods[1] presented a paper on the therapeutic action of streptomycin and promizole in clinical ocular tuberculosis in which he described his results in two cases of hemorrhagic retinitis or Eales's disease. The results were absorption of hemorrhages and improvement in the visual acuity.

Earlier, Schultz and Grunwell[2] described a case of recurrent retinal periphlebitis treated with parenteral streptomycin but without improvement.

Recently, I[3] presented a case of retinal tuberculosis in which, after therapy with streptomycin, the retinal hemorrhages disappeared and the visual acuity improved. It was assumed—though not proved—that streptomycin was of value in the treatment of retinal tuberculosis. The object of this paper is to present a brief follow-up of this case and to present another case of Eales's disease treated with streptomycin.

REPORT OF CASES

CASE 1

This is a follow-up report on A. B., a 32-year-old white man, seen in July, 1947, who experienced vitreous hemorrhages in both

eyes. Ophthalmoscopy at that time revealed retinal hemorrhages. After a three-month course of streptomycin therapy (1.0 gm. daily in subdivided doses) the retinal hemorrhages disappeared and the visual acuity improved.

Observations were made during October, 1948, March and October, 1949, at which time funduscopy failed to show any evidences of new retinal hemorrhages. Visual acuity in both eyes was 20/25.

Case 2

L. A., a 21-year-old white man, was first seen on March 28, 1947, complaining of "blindness" in both eyes. In July, 1946, he experienced a massive vitreous hemorrhage in the left eye, and in October, 1946, in the right eye. The past and family histories were irrelevant. The tuberculin test was three-plus. Pulmonary roentgenograms were negative.

Ocular examination was: Visual acuity: R.E., 20/400, at 10 feet; L.E., 20/400, at five feet. With the slitlamp, the cornea, anterior chamber, iris, and lens were normal in both eyes. Ophthalmoscopy showed a black fundus reflex, both eyes.

A course of tuberculin desensitization was immediately instituted and continued for over one year. Prior to this, a course of X-ray therapy was applied to each temporal region. With these measures there was some improvement.

On May 12, 1947, visual acuity in the right eye was 20/400 and in the left eye 20/200, but on May 15, 1947, it was hand movements in both eyes and there was a complete black fundus reflex. On July 14, 1947, vision was: R.E., 20/300, L.E., 20/400; on December 8, 1947, again the vision was hand movements in both eyes. In short, the history and the observations in this case were that of recurrent vitreous hemorrhages up to July, 1948.

In July, 1948, for a period of 42 days he was administered streptomycin (1.0 gm. daily in subdivided doses). On September 20, 1948, following the completion of this course, visual acuity in the right eye was 20/100−1 and in the left eye, 20/200. Since then a recurrence of vitreous hemorrhages has not been observed. As of November 22, 1948, his vision was 20/80+2 in the right eye and 20/100−2 in the left eye. The fundi showed areas of retinitis proliferans and numerous glial bands.

Comment

The two cases presented were treated only with streptomycin prior to Woods's report on the therapeutic action of the combination of streptomycin and promizole. Streptomycin proved of value in these patients.

Both cases follow the diagnostic criteria for ocular tuberculosis as outlined by Woods: "(1) The ocular disease must conform to a pattern commonly regarded as tuberculous, and one in which histologic examination of eyes with similar disease patterns had uniformly demonstrated the probable tuberculous nature of the disease; (2) the patient must show elsewhere in the body evidences of a preceding tuberculous infection, a source from which the ocular infection might logically have arisen; (3) the cutaneous reactions to tuberculin must be in conformity with those for the patient's age and tuberculous status; and (4), the most thorough and exhaustive medical survey possible should reveal no other systemic disease or cause to which the ocular inflammation could logically be attributed."

1330 Union Street.

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EXTRINSIC MUSCLE PARESES IN HYPERTHYROIDISM

HERMAN ZONDEK, M.D.
Jerusalem, Israel

Although association of hyperthyroidism with pareses of the extrinsic ocular muscles is not rare, the question as to whether the condition is of thyrogenous origin has never been sastisfactorily answered. In some cases partial, in others complete, ophthalmoplegia has been noted. Usually ophthalmoplegia is associated with exophthalmos, but it may also occur without.

In the majority of cases, ophthalmoplegia has been considered the result of genuine thyrotoxic myopathy, in a few co-existing myasthenia gravis was found to be the underlying disturbance.

Of late I have observed two cases of hyperthyroidism with partial ophthalmoplegia in which the ocular phenomena could not be attributed to either thyrotoxic myopathy or myasthenia gravis. Exophthalmos was present in neither case.

CASE REPORTS

CASE 1

The first case was that of 44-year-old woman who had a mild form of thyrotoxicosis (slight loss of weight, nervous hyperexcitability, heart palpitations [pulse rate 96 to 120], no abnormal perspiration, mild adynamia, mild tremor; the basal metabolism rate was plus 14 percent). All the more conspicuous was the extent of the ocular disturbances arising simultaneously with the onset of the toxic manifestations; predominant was paresis of both the superior and the external rectus muscles of the left eye associated with epiphora and conjunctivitis (fig. 1).

Symptomatic treatment (intravenous glucose, quinine, prominal) readily brought the thyrotoxic manifestations under control without affecting, however, the ophthalmoplegic phenomena at all. Neither was prostigmin effective.*

Fig. 1

Fig. 2

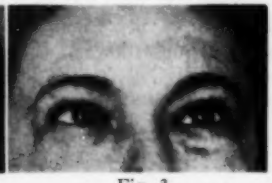


Fig. 3

Figs. 1 to 3. (Zondek). All three persons are attempting to glance at the same object above their heads. (Fig. 1) Paresis of both the superior and external rectus muscles of the left eye, associated with epiphora and conjunctivitis. (Fig 2) Normal person. (Fig. 3) Paresis of both the superior and internal rectus muscles of the left eye, associated with diplopia.

CASE 2

The second patient was a 42-year-old woman who had undergone roentgen irradiation of the pituitary gland according to Ira I. Kaplan for sterility. Directly thereafter, menstruation ceased entirely and she developed a full-blown thyrotoxicosis; that is, that variety of hyperthyroidism in which the toxic manifestations dominate at the expense of goiter and exophthalmos. (In passing it should be noted that to the best of my knowledge this is the first case in which stimulative radiation of the pituitary according to Kaplan led to the outbreak of thyrotoxicosis.)

The most striking feature in the clinical picture was partial ophthalmoplegia consisting of paresis of both the superior and the internal rectus muscles of the left eye (fig. 3) and associated with diplopia.

* After the paper was submitted for publication, the patient was given radioactive iodine elsewhere. Thereafter the basal metabolism rate was plus 1 percent. The ocular condition remained unchanged.

Besides, there was marked loss of weight, extreme nervousness, general adynamia, profuse perspiration, and diarrhea. The basal metabolism rate was plus 47 percent. Involvement of the muscular metabolism was indicated by a rise in urinary creatine excretion (creatine, 127 mg./100 cc.; creatinine, 763 mg./100 cc. in 24-hours' urine) and blood lactic acid (50 mg./100 cc.).

Treatment with iodine, antithyroid drugs, and finally thyroidectomy resulted in perfect normalization of both the clinical manifestations and the disturbance of muscular metabolism (gain in weight, loss of adynamia, nervousness, diarrhea, and perspiration; basal metabolism rate, plus 7 percent; creatine 66 mg./100 cc.; creatinine, 1,250 mg./100 cc. in 24-hours' urine; blood lactic acid, 11 mg./100 cc.).

After the lapse of one year, the patient had gained 27 Kg. in weight and displayed a number of myxedematous traits (pulse rate 54; blood cholesterol, 253 mg./100 cc.; basal metabolism rate, minus 13 percent). Yet the ocular phenomena remained stationary throughout. It should be added that prostigmin was also ineffective.

Summary and Conclusions

In two cases of hyperthyroidism associated with partial ophthalmoplegia, adequate treatment led to disappearance of all toxic manifestations without, however, affecting in the least the ocular pareses. This was particularly evident in the second case in which thyroidectomy produced a change-over into myxedema associated with extreme gain in weight.

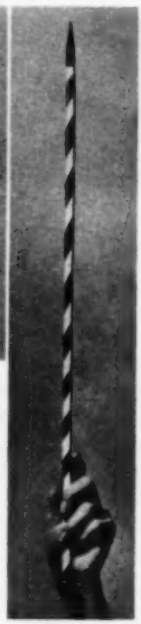
It follows that the ocular pareses can in neither case be ascribed to a thyrogenous origin. This negative conclusion appears significant. It recalls the present conception of the pathogenesis of exophthalmos in hyperthyroid disease. The development of the ophthalmoplegic manifestations in the second case points in fact to a primary disorder in the pituitary or the pituitary-diencephalic system. It will be the object of further study to search for a specific ophthalmoplegic principle.

8 Maimon Street.

AIDS FOR DETERMINING VISUAL ACUITY*

Morgan B. Raiford, M.D.
Atlanta, Georgia

Effort to determine accurately the visual acuity of young children is often a test of the ingenuity, diplomacy, and perseverance of the examiner. These little patients are being asked to evaluate objects and to follow a procedure that is strange to them, usually in an environment with which they are not too familiar. Not being certain of their surroundings, they are frequently reluctant to respond orally to the questions that are necessary to evaluate their vision.



Figs. 1 and 2 (Raiford). (Fig. 1) Patient holding the handle of the "E." (Fig. 2) Pointer made to resemble a stick of candy, black-tipped with red and white stripes.

* Manufactured by Walter Ballard Optical Company, 105 Peachtree Street, N.E., Atlanta, Georgia.

In the endeavor to make the visual acuity test a game, the "E" (fig. 1) and the pointer (fig. 2) were devised by Miss Evelyn Dugger, R.N., of the Atlanta Department of Public Schools.

When the "E" chart is used, the little patient is asked to hold the wooden "E" in his hand and, as the pointer is directed to an "E" on the chart, he is asked to turn his "E" in the same position as the one on the chart. This eliminates the necessity of an oral response and the process of testing can be made into a game.

The "E" (fig. 1) is constructed of plywood, painted black, and is similar in size to the standard "E," 20/200. The handle facilitates ease of holding. The pointer (fig. 2) is also of wood and painted to resemble a candy stick with a black tip.

These aids in determining the visual acuity of children have been used extensively in the school system of Atlanta and in the Ponce de Leon Eye and Ear Infirmary. They have also been found to be very practical in testing illiterate patients.

144 Ponce de Leon Avenue, N.E.

HERPES ZOSTER OPHTHALMICUS

Report of a case successfully treated with aureomycin

Roland I. Pritikin, M.D., and
M. L. Duchon, M.D.
Rockford, Illinois

Herpes zoster ophthalmicus has always presented an interesting clinical problem. The disease was known in ancient times, but not much was written about it until the early 19th century.

In 1818, Mahlis suggested that the eruption followed nerve distribution. Hutchinson, in 1866, was the first to describe the condition in detail and report several cases.

Herpes zoster has occurred in the proportion of one to two percent of all skin diseases. Over 2,300 cases of ophthalmic zoster have been reported in the literature to date. The cornea was involved in approximately 40 percent. The average age in those afflicted is about 45 years, and slightly more males than females have been reported.

The following case is unique in that the corneal involvement and the anterior uveal reaction, though severe, appeared after the skin lesions had been effectively treated.

Case report

A 59-year-old Negro, a foundry worker, was first seen on March 2, 1950, complaining of deep-seated neuralgic pain in the left eye and forehead of two weeks' duration and a vesicular eruption of one week's duration. The lesions first appeared on the left side of the forehead with gradual increase in swelling about the left eyelids, although no lesions appeared here. There was no history of injury and the patient had never had a similar condition.

The lesions were deep-seated vesicles that did not cross the midline. The contents were clear.

Examination of the eye revealed severe blepharospasm and edema of the lids. The cornea was sensitive and, under careful biomicroscopy, was essentially negative. The tactile tension was equal to that of the other eye.

The patient was referred to a dermatologist for treatment with a note that the eye be carefully watched for changes. The patient was hospitalized.

Serology and indicated laboratory studies were all negative. The treatment consisted of aureomycin (250 mg. four times daily), empirin compound with 0.5 gr. of codeine for pain, and 100 r of filtered rotengen rays. Bacitracin ointment was applied to the skin locally.

There was marked improvement in 48 hours, although the patient continued to require the anodyne because of the persistent neuralgic headache. The aureomycin was

discontined after four days and the patient went home on the sixth day with the lesions healing well and no specific eye complaints.

He was re-admitted to the hospital on March 21st, this time with definitely healed skin lesions, but with severe lid edema and definite eye involvement of one day's duration.

On biomicroscopy, two fairly large herpetic infiltrations were noted in the left cornea away from the pupillary area at the 11- and 5-o'clock positions. The iris was muddy and the light reflex was slow; the eye was soft.

Local treatment consisted of one drop of two-percent atropine, four times daily, hot packs for 20 minutes every hour, aureomycin ophthalmic solution (two drops every hour). Treatment by mouth was aureomycin (250 mg. every four hours around the clock) and empirin compound with 0.5 gr of codeine for pain. A magnesium sulfate purge was prescribed on admission.

Improvement was steady with a sharp decline in pain and noticeable change in the corneal lesions in three days. The lower and smaller lesion healed first, leaving a fine nebulous scar. Both lesions were healed by the third week.

The aureomycin by mouth was discontinued on the 14th day, but the aureomycin drops were continued four times daily until the day of discharge on the 21st day. The atropine was withheld after the 14th day. The iris was clear. The resultant fine corneal opacities do not affect visual function.

The patient had received 21 gm. of aureomycin by mouth over a 14-day period without any gastrointestinal complaints and with total effective healing of the corneal lesions with a minimum of scarring.

Talcott Building.

CATARACT EXTRACTION AFTER ELLIOT TREPHINING OPERATION*

HENRY F. JACOBIUS, M.D.
New York

It is often difficult to remove a cataractous lens in the presence of a large overhanging bleb following glaucoma surgery, especially when there is also a secluded pupil from a chronic iritis of long duration.

History. A Negro, aged 58 years, who appeared much older, entered the Metropolitan Hospital on October 30, 1949.

Vision in the right eye was light projection only. The patient gave a history of treatment for chronic primary glaucoma for many years. In 1948, an Elliot trephining operation was performed upon the right eye at the Metropolitan Hospital. For the past year, there had been a gradual diminishing of vision, until now he was unable to get about without assistance.

The left eye had been totally blind following a perforating injury at the age of six years. The eyeball was degenerated and soft to touch. The cornea showed old, diffuse infiltrates. The lens appeared to be calcareous and opaque.

Eye examination. There was a large filtering bleb in the right eye which overhung the upper fourth of the cornea. The slitlamp microscope showed numerous old keratic precipitates, as well as a small irregular pupil which was bound down concentrically at the pupillary border by ring synechias. There was a hypermature senile cataract. Tension was 18 mm. Hg (Schiøtz).

Operation. At operation on October 4, 1949, the pupil was small and did not dilate with two-percent homatropine, 10-percent solution of neosynephrin, and one-percent solution of atropine sulfate.

Since it seemed inadvisable to disturb the larger filtering bleb, a conjunctival flap was made at the temporal half of the eyeball.

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* From the Metropolitan Hospital, eye service of Dr. Charles A. Turtz.

Corneal sutures were introduced at the 8- and 10-o'clock positions.

A keratome incision was made at the 9-o'clock position and enlarged with McQuire scissors. A peripheral iridectomy was made at the 9-o'clock position, a spatula was introduced and, with some difficulty, the adhesions were broken up. Tooth forceps were introduced, and a large piece of capsule was removed.

The lens was delivered in the usual manner through the temporal incision without any loss of vitreous. The incision was brought together, and some gelatinous cortex was irrigated with saline. A remaining loose piece of capsule was removed with smooth capsule forceps. The iris pillars were replaced.

The corneal sutures were tied, and two cc. of air were introduced into the anterior chamber. Interrupted silk sutures were used for the conjunctival flap. Atropine was instilled, and a bilateral patch was applied.

The postoperative course was uneventful. The anterior chamber reformed on the second day. Most of the keratic precipitates were absorbed, and the eye was white about 10 days after operation.

With a +10.0 D sph., vision in the right eye is 20/30−, and, oddly enough, the filtering bleb has become smaller in size.

300 West 23rd Street (11).

MODIFICATIONS OF OPERATIVE METHODS OF COMPLICATED CATARACTS*

F. Papolczy, M.D.
Budapest, Hungary

Operation of senile cataract has been advanced to such a degree of perfection that this progress should influence favorably the operative technique of other kinds of cataracts as well.

The following technique has been used for the so-called complicated cataract including "cataracta uveitica," caused by repeated irido-cyclo-uveitis, and the "cataract of the glaucomatous eye," as well as cataracts due to the different diseases of the retina or to other ocular or systemic diseases.

It is an accepted rule that increased or improved vision by a cataract operation may be anticipated only if light sensitivity and light projection of the eye to be operated upon is satisfactory. There are of course, exceptions—in cases of chronic glaucoma, advanced pigmentary degeneration of the retina, and other alterations of the fundus, despite faulty projection of light because of contraction of the visual field, the operation may result in quite satisfactory visual acuity.

The following case is noteworthy: A man suffering from advanced retinitis pigmentosa had perception of light at three meters in each eye. Projection of light was limited to the center. Several ophthalmologists refusing, I undertook the intracapsular and round-pupil operation and obtained a postoperative visual acuity for each eye of 5/5 with suitable correction.

Bad perception and especially faulty projection of light do not invariably mean contraindication to cataract operation. The problem, as to whether or not the cataract should be extracted in cases of deficient projection, is to be considered individually in each case.

Cataracts due to uveitis or other inflammations should not be operated on until the inflammation has been quiet for sufficient time so that it will not recur and the eye be destroyed by it. This is especially true of the cataracts following sympathetic ophthalmia.

To perform a cataract operation on a blind eye for cosmetic reasons only is a considerable risk. If blindness is due to cataract following uveitis, the operation may result in recurrence of the inflammation, and phthisis bulbi frequently follows. In absolute glaucoma the danger of expulsive hemorrhage is to be considered, especially if the ocular tension is high. If an old detachment of the

* From the Department of Ophthalmology, St. Stephen's Hospital.

retina is present, removal of the lens may accelerate atrophy of the eye.

Extraction of a complicated cataract is a more difficult task and requires greater care than the operation of a senile cataract. Possibility of vitreous loss is greater; therefore, the tension of the eye should be reduced by retrobulbar injection.

The rule that the lens should be removed together with its capsule and that the wound

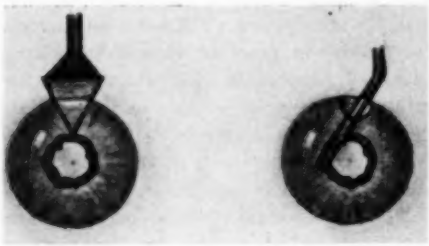

Fig. 1 (Papolczy). Preliminary steps in the extraction of a complicated cataract.

be sutured holds good especially for complicated cataracts; the intracapsular extraction of the lens favors healing at first intention without irritation, while application of deep sutures prevents undesired sequelae during and after operation. Considerable difficulties may be encountered if a complicated cataract extraction is attempted through a round pupil. However, as will be seen, it is more often possible than formerly believed.

With cataract uveitica circular posterior synechias are often present. The pupil cannot, therefore, be dilated and no attempt is made, as a rule, at round-pupil extraction. Instead, a total iridectomy is performed, the adhesions are separated, and the lens is removed. However, round-pupil extraction is often possible in cataracta uveitica if the eye is prepared in the following manner.

A small incision of four to five mm. in length is made by means of a keratome at the 12-o'clock position, and basal iridectomy is performed; then the spatula employed in cyclodialysis is passed between the iris through the coloboma, and the adhesions are separated (fig. 1). If they synechias are too thick or resistant, they are divided by Wecker's scissors.

Then one drop of a five-percent atropine solution or a triple solution consisting of scopolamine-cocaine-adrenalin is instilled; this treatment is repeated 12 hours later and on the following days to keep the pupil dilated and to prevent the formation of new synechias. Some weeks or months afterward, round-pupil extraction is performed with ease.

A similar procedure may be applied if, in the course of a cataracta uveitica, iris bombé is developing as a sequel of circular posterior synechias, or a secondary glaucoma has developed.

The anterior chamber is in these cases very shallow, or the iris lies very close or on the posterior surface of the cornea; therefore, the incision can be managed only by incision ab externo with a straight keratome held perpendicularly to the surface, with due caution not to injure the iris. After the operation the pupil is dilated by a one-percent adrenalin solution. This method is not easy and requires experience.

Not infrequently a cataract develops in a glaucomatous eye. It may be independent of the glaucoma or occasionally be its sequel. This "cataracta in oculo glaucomatoso" should be distinguished sharply from secondary glaucoma due to swelling of the lens "cataracta glaucomatosa."

The technique of removing a cataract which has developed in a glaucomatous eye depends, first of all, on the intraocular pressure, and on whether the eye had or had not had a previous operation for glaucoma.

If there has been no operation for glaucoma and the tension does not exceed 30 mm. Hg (Schiøtz), or may be reduced by means of miotics to this level, a retrobulbar injection of novocain and cautious dilatation of the pupil immediately before operation by means of one-percent or 1:1,000 adrenalin solution renders round-pupil extraction more possible.

If the anterior chamber is shallow, first a

small incision, not extending at most more than one fourth of the corneal circumference, is made by means of a Graefe knife and is enlarged on both sides to the necessary width by scissors.

If the tension is above 30 mm. Hg, an operation for glaucoma must first be undertaken. If no such operation is possible for any reason, or the operation fails to reduce tension, this can be achieved by electro- or thermopuncture at the equatorial region of the sclera at the inferior-medial or inferior-lateral side between the two rectus muscles. Afterward the tension decreases and the anterior chamber becomes deeper.

Directly after this treatment, or some days later, intracapsular round-pupil extraction can be performed with facility. Several authors have proposed posterior sclerotomy for reducing tension but, since this method is capable of provoking intraocular hemorrhage or detachment of the retina, I prefer electro- or thermopuncture.

If there has been a previous operation for glaucoma, still greater difficulties arise. Cyclodialysis is generally followed by adhesions of the edge of the iris, wherefore complete iridectomy should be done. In cases in which iridectomy, trephination, or several glaucoma operations have been performed in the upper part of the eye, it is almost impossible to make a suitable flap. In such cases, it is preferable to prepare a conjunctival flap which, after the operation of total iridectomy, is drawn at least over the upper half of the cornea. Several authors place the cataract incision below for eyes which have had a trephination for glaucoma or have had repeated operations. This operation is, however, even more difficult to perform and the total iridectomy placed below results in unsatisfactory vision. Wherefore this method is not to be advised.

The extraction of a cataract complicated by glaucoma or other diseases of the eye presents a difficult problem. Possible operations to be performed in such cases should be decided only after due consideration of the individual case and careful planning of the details of the operation.

St. Stephen's Hospital.

FIXATION-LIGHT HOLDER MODIFICATIONS

For screen and cover test in cardinal positions for near

Joseph E. Brumback, Jr., M.D.
Baltimore, Maryland

The present commercial fixation-light holder fails to offer sufficient adaptability for routine use in indicated cases. If the testing is done with the patient seated in a chair without a headrest, it cannot be adjusted for the various heights without the use of an adjustable table; nor can it be used with the headrest and table of the Poser or Universal slitlamps, as there is insufficient table space to attain the proper working distance.

Fig. 1 (Brumback). Fixation light set up for use with Poser slitlamp.

The best workable set-up with the present models entails a headrest at the end of an adjustable table. Finally the cost is considerable and ophthalmologists may for this reason fail to get this extremely useful device.

The instrument* herein described is so modified in construction that the arm and the light can be raised or lowered from a low of 30 inches to a high of 55 inches because they are mounted on the base of a music stand.

The power is obtained from a battery box with a detachable lead running to the rotating arm. The bulbs are Welsh-Allyn No. 2, and two standard flashlight batteries are used.

A toggle switch permits either the central bulb or the one on the rotating arm to be turned on, while a rheostat control permits wide variation in the intensity of either light. The bulbs are separated by a distance of 15.4 cm., giving the required angle of a 25-degree arc when the instrument is used at 33 cm.†

The modifications permit the use of the Poser or Universal slitlamp headrest for the muscle fields, eliminating the need for additional table-chinrest equipment. The device is completely portable and can be disassembled rapidly and stored when not in use. The cost of having the instrument built according to the specified modifications is extremely moderate.

Medical Arts Building (1).

* Built by Mr. J. H. Stanford, Jr., 839 West University Parkway, Baltimore 10.

† Owens, W. C.: A fixation light for the cardinal directions of gaze. Am. J. Ophth., 30:611, 1947.

Ophthalmic Miniature

The visual axis being fixed in any direction, I can at the same time see a luminous object laterally at a considerable distance from it but, in various directions, the angle is very different. Upwards it extends to 50°, inwards to 60°, downwards to 70° and outwards to 90°. . . . The sensible portion of the retina seems to coincide with the painted choroids of quadrupeds: but the whole extent of perfect vision is little more than 10 degrees; or more strictly speaking, the imperfection begins within a degree or two of the visual axis and at the distance of 5 or 6 degrees becomes nearly stationary, until at a still greater distance, vision is wholly extinguished.

Thomas Young, M.D., F.R.S.,
"On the Mechanism of the Eye,"
Transactions Philosophical Society, 1801.

SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

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DR. SIDNEY A. FOX, *president*

ROUND-TABLE CONFERENCE

Diagnostic Methods in Ophthalmology

VALUE OF HEAD TILT IN DIAGNOSIS OF MUSCLE PARALYSES

DR. FRANCIS HEED ADLER said that head tilt is a characteristic sign of paralysis of an oblique muscle, especially a superior oblique, and, as such, is of value in differentiating between paralysis of the obliques and paralysis of the superior and inferior recti.

An individual with paralysis of an ocular muscle is presented with diplopia. Horizontal diplopia is quite easily avoided by turning the face in the direction of action of the paralyzed muscle. Vertical diplopia is less easily disposed of by elevating or depressing the chin. Torsional diplopia can only be gotten rid of by making use of the normal torsional movements of the globe caused by the otolith apparatus when the head is tilted on one of the shoulders.

Individuals who have paralysis of the superior oblique muscle always tilt the head to the opposite side when head tilt is present. While it is generally believed that head tilt is initiated by diplopia, the head tilt persists although the individual may have learned suppression, such that the diplopia is impossible to elicit.

Tilting the head to the shoulder on the same side as the eye with the paralyzed superior oblique is also a useful test to confirm the diagnosis of paralysis of this muscle, as under these circumstances the eye is usually strongly elevated. The explanation of this elevation of the eye was given, based on the general principles of Hering's law.

EPITHELIAL DOWNGROWTHS INTO THE ANTERIOR CHAMBER

DR. MILTON BERLINER limited his discussion to epithelial downgrowth following cataract extraction. He said that there unquestionably has been a great increase in the incidence of epithelial downgrowth following cataract extractions since the employment of corneoscleral sutures. Dr. Berliner, himself, had collected about 18 cases.

These cases were operated on by different surgeons with varying techniques; keratome and scissors as well as Graefe knife incisions were used. In analyzing these cases one common feature came to light; that is, that in not one of these cases was a presectional conjunctival flap prepared.

Modified Stallard and direct edge-to-edge sutures were used. In 14 instances the extraction was intracapsular. With these types of sutures, infolding and inclusion of conjunctival tags is possible. Dr. Berliner said he believes that epithelial downgrowth in these cases is always derived from the conjunctiva.

With this form of epithelial downgrowth as evidence by histologic studies in two cases, it is not necessary that the invading epithelium line the walls of the anterior chamber in their entirety or that a cyst form before usefulness of the eye is destroyed. A two- to three-mm. downgrowth on the posterior surface of the cornea is all that is necessary to induce a dystrophic keratitis that rapidly and inexorably ruins the cornea.

In only one of these cases was the intraocular pressure raised at any time. In other words, the resulting corneal dystrophy (involving all its layers) is not necessarily a consequence of glaucoma.

Evidently, epithelium growing down on the posterior surface of the cornea is very toxic to the normal metabolic processes. Whether destruction of the endothelium is a primary or secondary feature is still unknown.

The diagnosis of epithelial downgrowth should be suspected if, after the fourth week, the eye remains irritable and somewhat inflamed and the patient complains of photophobia, tearing, and even pain. With the biomicroscope, the chamber may or may not be shallow, but the diagnostic feature is the presence of a grayish opaque membrane on the posterior surface of the cornea extending from the wound. In two cases examination of the wound itself revealed small vessels invading into the deeper layers.

Within a few weeks, the epithelium overlying the involved areas begins to show edema and punctate changes. From this point on, a progressive corneal dystrophy develops which finally destroys the usefulness of the cornea.

Treatment of this condition should first be directed toward its prevention, and Dr. Berliner expressed his belief that it is preventable. He said that when employing corneoscleral sutures, it is mandatory that a presectional conjunctival flap be prepared so as to prevent the inclusion of any conjunctival tags into the wound. Dr. Berliner said that he preferred the limbus base dissected for the full extent of the incision. X-ray therapy for the control or cure of this complication has not proved satisfactory.

Measurement of the deviations of the eyes

Dr. Hermann M. Burian said that, in testing for anomalies of the neuromuscular apparatus, it is necessary to determine two things. First, the relative position of the eyes in casual seeing and under special test conditions; and, second, how the patient uses his eyes together. For the determination of the relative position of the eyes both subjective and objective methods may be employed.

There has been considerable, and at times rather acrimonious, discussion about the superiority of the objective type of test over the subjective type. In considering the relative merits of the two groups of methods, one must first ask oneself what is meant by the terms "objective" and "subjective." In the so-called objective method, the examiner is the one who makes the observation and tests the measurements. In the so-called subjective methods, the patient is the subject who makes the observations and measurements.

In both cases the accuracy of the observations is determined by the accuracy of the visual system. This accuracy is very high and there is no prima facie evidence that the patient is less intelligent or a poorer observer than the doctor.

The question should be, therefore, not whether a test is "objective" or "subjective," but whether the particular test is appropriate for the intended purpose.

Objective methods—such as the prism and cover test, corneal reflex test, and so forth—are indispensible, not because they are better than the subjective tests, but because they are the only tests by which one can determine the relative position of the eyes independently from the coöperation of the patient and irrespective of his binocular vision. This is the information we need. Having an idea about the position of the patient's eyes, we can apply methods which make use of the information derived from the patient's reports.

In appropriate cases, these methods—such as the diplopia test in various positions of gaze, the red-green test, and all the rest—allow us to obtain the information which we seek with considerable speed and with greater accuracy than is possible with the objective tests.

The objective and subjective tests are, therefore, by no means in opposition or conflict. Properly applied they supplement each

other and we cannot get along without either type of test.

Ocular disturbances associated with malnutrition

Dr. Arthur M. Yudkin said that the ophthalmologist has long recognized that faulty nutrition may interfere with the normal function of the eye. Patients exhibiting a pathologic eye condition may be suffering from the lack of essential substances in their daily diet.

The frank characteristic symptoms of nutritional deficiencies have not been observed in this country for many years except in city hospitals or endemic regions.

The eye symptoms that have been attributed to the lack of vitmain A are xerophthalmia, keratomalacia, cysts of the lid, infections of the meibomian glands, calcareous deposits in the palpebral conjunctiva, conjunctivitis with lack of luster and wrinkling of the conjunctiva, pigmentation of the conjunctiva, blepharitis, hordeola, poor lacrimation, edema and puffiness of the lids, and night blindness.

Many of the aforementioned ocular disturbances have also been included in the lists that have been cured by supplementing vitamin-B complex in the diet.

The vitamin-B group recognized as B complex is made up of many factors. The factors most frequently used in the treatment of ocular disturbances are thiamin chloride, riboflavin, and nicotinic acid. The remaining components of vitamin-B complex are also valuable in restoring refractory ocular disturbances. Further clinical investigation may disclose their real value.

The most constant and striking manifestation of vitamin B_1 or thiamin deficiency arises from degenerative processes in the nervous system. Although the typical neurologic symptoms and signs are those of peripheral neuritis, clinical experience indicates that vitamin B_1 may also be concerned in diseases of the ocular nerves. Wernicke's syndrome is believed to be caused by vitamin-B_1 deficiency.

In the past few years thiamin chloride in large doses has also been used very extensively in the treatment of all types of acute retrobulbar neuritis, but vitmain B_1 does not seem to be as effective in these conditions as it is in the toxic amblyopia due to alcohol and tobacco. According to Jolliffe the neurasthenic syndrome is probably the most common manifestation of isolated vitamin-B_1 deficiency.

The ocular symptoms most frequently associated with ariboflavinosis are photophobia, sensation of burning or roughness of the eyelids, visual fatigue, and sometimes impairment of visual acuity. The commonest sign is circumcorneal injection often with invasion of the cornea by capillaries from the limbus plexus.

It has recently been shown that some types of conjunctivitis and keratitis require a supplement of niacin to relieve the ocular inflammation. There are some forms of ocular disturbances such as marginal ulcer, dendritic ulcer, and interstitial keratitis that do well only when vitamin-B complex is given in large quantities.

There are reports of nutritional retrobulbar neuritis in children in Kingston, Jamaica, by Whitbourne, Clark, and Carrol. There was blurred vision for distance and near, and careful observation of these children revealed central scotomas. This type of ocular disturbance occurred most commonly in children between eight and 14 years of age, of the poorer social and economic classes. Associated with the ocular disturbance were excoriations at the angles of the mouth, greasy desquamations along the nasolabial fold, sore mouths and tongues, and blepharitis. The skin was overly dry and, in some instances, it was also thickened and cracked.

The classic lesion of vitamin-C deficiency is scurvy with its manifestations of bleeding from the gums, hemorrhages underneath the skin and ocular conjunctiva. A number

of cases of chronic infection of the cornea have improved when large doses of vitamin C have been taken. Treatment with cevitamic acid has not only improved patients' eyes but also their general condition.

Vitamin C is valuable in many cases of ocular disturbance where the vascular system has not been functioning normally because of some alteration in the blood stream or changes in the blood vessels. If the hemorrhagic retinopathy is associated with diabetes, the latter condition must be treated properly before favorable results can be expected.

Many of the hemorrhages appearing in the vitreous because of local arteriosclerosis and general hypertension are improved if large amounts of cevitamic acid (300 to 500 mg.) and rutin are given daily. Edema of the macular region produced by vascular decompensation often responds more rapidly when this amount of cevitamic acid and 10 to 32 ounces of orange or grapefruit juice are given daily for several days.

Diagnostic value of transillumination of the eyeball

Dr. Francis H. Adler said that the practical value of transillumination is not equal to its theoretical value. Since the degree to which light passes through the ocular coats and media depends upon the absorption of the light by pigment, no differentiation can be made between pigmented tumors and hemorrhages. A large hemorrhage will prevent light from passing through it.

A number of years ago, a German worker measured the transmission of light through layers of fluid containing blood in various forms. Laked blood transmits rays of light fairly well compared to a suspension of whole corpuscles. The corpuscles themselves have the power of breaking up the light by diffraction and preventing its passage through a layer of fluid.

Dr. Adler said that it must be remembered that only pigmented tumors interfere with transillumination, and therefore retinoblastomas and leukosarcomas will generally transilluminate perfectly. Too much reliance must not be placed on transillumination, therefore, in deciding the presence of an intraocular growth.

Width of angle of anterior chamber

Dr. Milton Berliner said that the depth of the angle recess cannot be accurately measured without the employment of gonioscopic technique. However, the depth of the angle recess unquestionably narrows directly with the shallowness of the anterior chamber.

Biomicroscopically, it is possible to measure the depth of the anterior chamber: first, approximately, by the simple means of stereoscopic depth perception; secondly, and more accurately, by means of the Ulrich drum attached to the microscope or by means of a micrometer eyepiece.

Directing the beam with as narrow an angle as possible, the axis of the microscope being at right angles to the cornea, one measures the depth of the anterior chamber in the region of the iris periphery; that is, the distance between the posterior corneal surface and the surface of the iris. This should be performed with a narrow beam. It is important to have the beam projected as close to a right angle to the cornea as possible since, with an oblique direction of the beam, the distance between these two points of reference would be erroneously greater.

Owing to the fact that in the recess of the angle the iris thickness suddenly thins out, one should add about one fifth of the reading obtained to get an approximate measure of the depth of the angle recess. A correcting factor (Hartinger) for corneal refraction must also be used.

Diagnostic value of occlusion

Dr. Hermann Burian said that, by occluding one eye which normally contributes to a smaller or larger extent to the total act of vision, we exclude the fixation reflex from the occluded eye and the impulses deriving from the fusion reflex.

By occluding we determine, therefore, the

effect of these reflexes on the position of the patient's eyes. This effect will obviously be small if the patient has no binocular vision to begin with, or only those rudiments found in cases of manifest strabismus. It is all the more pronounced in patients without manifest strabismus or with intermittent heterotropia.

As a rule, patients with heterophoria or intermittent heterotropia, especially esotropia, develop a strong compensatory innervation. It is not always possible to make such patients relax their compensatory innervation simply by performing a cover test or by placing a Maddox rod over one eye for a brief period of time; under these conditions the patients will often reveal only a small fraction of their heterophoria. By covering one eye of such patients for a longer period of time one will soon find that the amount of their heterophoria is considerably greater than is revealed in the first test.

Dr. Burian said that he has made it his rule to occlude one eye of patients who show a significant exophoria, or for that matter any kind of heterophoria, and invite them to sit in the waiting room for 15 to 20 minutes with one eye occluded and to measure the deviation again after that period.

If the deviation of their eyes has significantly increased, Dr. Burian said that he continues to occlude their eyes for periods of 15 to 20 minutes until no further increase in the heterophoria is found.

In doing so, certain interesting features are revealed. For instance, a patient who in the first test may show 15 prism diopters of exophoria for distance and 30 prism diopters for near, indicating a definite convergence insufficiency, may show an increased amount of exophoria for distance without an increased exophoria for near. Other patients will continue to show the same ratio between the exophoria for distance and for near. Obviously, the situation differs significantly in these two groups of patients.

This is only one of the possible applications of occlusion in diagnosis. Another application relates to long occlusion, which can be used when one is not certain that the subjective symptoms of a patient are due to an anomaly of the binocular coöperation. Such patients are asked to occlude one eye constantly for a period of eight to 10 days. If they report relief of symptoms, one may assume that the symptoms are due to improper binocular coöperation, either motor or sensory in nature.

Nutrition and chorioretinopathy

Dr. Arthur Yudkin said that, when a patient over 40 years of age complains of painful eyes, photophobia, lacrimation, inability to tolerate smoke, difficulty in night driving, and no desire to read, it is important to rule out errors of refraction, muscle imbalance, and emotional stresses that might be occupational or domestic. Frequently when these patients are examined routinely, the fundus appears normal at first but, as the posterior half is viewed more carefully, small white or yellow dots either single or arranged in groups may be detected.

There are many types of punctate deposits in the choroid and retina that have been described. Duke-Elder classifies the punctate condition of the fundus as a degenerative process and says that it appears in three sets of circumstances.

The first type is a degenerative process in diseased states of the retina or choroid. It may be either vascular, inflammatory, or neoplastic in origin.

The second type is a separate clinical entity occurring in young adults and considered as a primary degeneration. Retinitis punctata albescens of Mooren is considered as typical of this group.

The third type is classified as a senile phenomenon analogous to the Hassall-Henle bodies deposited on Descemet's membrane. This type is extremely common and may be seen occasionally at the age of 30 years, very frequently over the age of 45 years, and constantly over 60 years of age.

The punctate bodies may also occur in

young people and their presence is attributed to some obscure general or local metabolic disturbance. Many observers regard the bodies as colloid in nature and place their formation in the cuticular portion of Bruch's membrane. Several theories of origin have been considered, but as yet the problem is unsolved.

The punctate changes in the fundus are also known as Gunn's dots. They are small, white or yellow deposits without any pigment changes adherent to them. The dots may be single, but generally are found contained between the equator and the ora serrata.

When the fundus is viewed with subdued light to overcome the sheens of the retina and vitreous, the area adjacent to the dots appears moth-eaten or mottled but, with careful observation, the altered tissue of the fundus is neither raised nor depressed. Rarely is there any active inflammation in the deposit.

Frequently, the fundus picture may resemble that of a diffuse colloid degeneration, a massive colloid degeneration, or a central colloid degeneration. The deposits in the fundus are not drusen.

The fundus picture does not seem to change under treatment and the visual acuity remains the same over a long period of time.

Dr. Yudkin said that he has inquired about the early nutritional experience of these patients who present guttae or spots in the fundus. It is apparent, from their life histories, that they were afflicted with some type of nutritional disturbance in early infancy. When confronted with inquiry of poor nutrition or ill health, the patient is surprised at first because of a vague memory, but a consultation with the members of the family usually brings forth an interesting history of malnutrition and some form of nutritional deficiency.

Earliest signs of sympathetic ophthalmia

Dr. Francis Heed Adler said that, through the courtesy of Col. Austin Lowrey, Chief, Ophthalmology Section, Army Medical Center, Washington, D.C., he had the opportunity of seeing a manuscript on sympathetic ophthalmia prepared by Colonel Lowrey, and that he had received permission to quote from this paper. Statistics show that sympathetic ophthalmia is uncommon in the first or second week following an injury, and that 61 percent of the cases occur between the third and eighth week, 24 percent between the second and 12th month, and 10 percent after the first year.

It must be remembered that sympathetic ophthalmia is of insidious onset, and every ophthalmologist must be alert to the danger of sympathetic ophthalmia in every case of penetrating injury to the globe, especially when there is inclusion of uveal tissue. In the earliest stages there is usually aqueous flare and keratic precipitates with a continuance of cyclitis in the injured eye.

Colonel Lowrey stated that there are 80 cases with sympathetic ophthalmia on record in which the exciting eye was enucleated within 14 days after injury and which subsequently developed sympathetic ophthalmia in the remaining eye. There are also other cases on record, one by Fuchs, in 1932, in which the injured eye was enucleated six days after injury and seven months later the patient developed sympathetic ophthalmia. In another case reported by Samuels in 1936, the exciting eye was enucleated immediately after suspicious signs, and the pathologic examination showed early infiltration, yet the sympathetizing eye went on to complete blindness.

Examination of vitreous and fundus

Dr. Milton Berliner said that the technique for examination of the deeper vitreous and fundus by means of the biomicroscope or slitlamp is not new. Thirty years ago, Koeppe devised the ortho-bitumi mono-objective microscope, mirror, and contact lens for this purpose.

Later Kleefield modified Koeppe's tech-

nique by directing the light source from above so that the ordinary Czopski microscope could be used. Kleefield also modified the Zamenoff method thus obviating the necessity of a contact lens.

The use of the contact lens to neutralize corneal refraction has always proved difficult. In 1928, Lemoine and Valois after Stilling (1878) suggested the use of a minus lens placed in front of the eye to replace the contact lens. However, they did not use the focal slitlamp beam.

Lately Hruby adapted this method, that is, the use of a minus lens of 55D, the so-called preset lens with the focussed beam of the slitlamp. The principle of the method depends on the ability of observing along its axis the beam as it approaches and impinges on the retina; this requires a very narrow angle between observation and illumination.

Goldman devised a prism attached to the illuminating system. Dr. Berliner said that he adapted the Goldman prism to the Bausch and Lomb biomicroscope but, owing to the width of the tubes holding the prisms in the microscope, it was not possible to obtain a sufficiently narrow angle between the axis of illumination and observation.

Dr. B. Priestley and Dr. Berliner devised a stronger prism which can be used when attached to the end of the Poser illuminating arm which works very well. Others have used single or double mirrors to accomplish this. The main point of this method of examination is the possibility of obtaining an optic-section view of the tissues traversed.

The deeper areas of the vitreous can be visualized by this method. When detached, the posterior limiting layer of the vitreous can be recognized. The thickness of the retina can be observed as the narrow beam passes through it and the underlying choroid appears as a brown line.

This method offers a means of diagnosis of details previously not available by means of the ophthalmoscope. Not only is localization feasible but, with the narrow beam, elevations and depressions become recognizable.

Many obstacles still remain, however, and there is room for considerable improvement. It is still not easy to get optical sections toward the periphery or in highly myopic eyes. Dr. Berliner said that he agreed with Goldman that the contact lens gives clearer pictures.

Determining abnormal retinal correspondence

Dr. Hermann Burian said that anomalous correspondence represents an attempt of the organism to adapt the sensory conditions of the visual organs to the faulty motor condition present. This process of adaptation is specific for the condition in which the patient uses his eyes.

Tests for anomalous correspondence which closely imitate these conditions of casual seeing are most likely to bring out the sensorial retinal relationship which is habitual with the patient. The farther removed the test conditions are from the conditions of casual seeing the less likely are we able to obtain a response of the patient comparable to that in casual seeing.

Normal correspondence is almost never completely lost and anomalous correspondence is not rooted equally deeply in all patients.

In patients in whom anomalous correspondence is very deeply rooted, we are most likely to elicit an abnormal response with all kinds of tests. In those patients, however, in whom the abnormal correspondence is only relatively superficially established we are likely to elicit an abnormal reaction with tests approximating the conditions of casual seeing, and the normal reaction with tests farther removed from the conditions of casual seeing, since the patient is not adapted to the unusual conditions presented to him in these tests.

The test with the synoptophore duplicates most closely the conditions of casual seeing. Farthest removed from the natural use of the eyes is the after-image test. It is, therefore, understandable that we most frequently

find an abnormal retinal relationship in the synoptophore test and least frequently in the after-image test. This does not invalidate either test. Actually this difference contributes to their usefulness.

If we find that a patient shows an anomalous correspondence in the synoptophore test, the diplopia test, and the after-image test, this indicates that the abnormal correspondence is deeply rooted and the likelihood that this patient will regain binocular vision is rather doubtful.

The prognosis is considerably better in a patient who presents an anomalous correspondence on the synoptophore, and normal correspondence in the after-image test.

Dr. Burian said that he had never seen it happen that a patient who showed abnormal correspondence in the after-image test would present normal correspondence on the synoptophore.

In evaluating the tests for retinal correspondence, one must say that not one of them presents an advantage over the others, but rather that they all give specific information and that it depends on the information sought which test should be applied. It is, of course, highly desirable to use routinely at least the two tests mentioned, in order to get a clear picture of the patient's sensorial retinal relationship.

Differential diagnosis of vascularization of anterior segment

Dr. Arthur Yudkin said that, in view of the recent opinions that the metabolism of the cornea is very active, it has been suggested that, in the event of a disturbance of the normal respiratory system of the avascular cornea, the oxygen required for the activity of the cornea is supplemented by an invasion of the tissue by ingrowing blood vessels. The type of vascularization depends on the severity of the damage to the respiratory system of the cornea.

In interstitial keratitis, the corneal lesion at first may be monocular, starting with a fine cellular infiltration at the periphery with circumcorneal injection. Deep vessels extend into the corneal stroma from the periphery into the center.

The hazy cornea with vascularization gives rise to the "salmon patch" sign. The acute phase is frequently associated with iritis, cyclitis, and occasionally anterior choroiditis.

Tuberculous interstitial keratitis shows the same differential diagnostic points except for the appearance of an occasional phlyctenula at the limbus and a more frequent nodular iritis. The corneal involvement does not absorb as readily as it does in the syphilitic condition.

In sclerosing keratitis, there are fine deep vessels which run radially into the cornea for a few millimeters, then the vessels alter their course and run toward the corneal margin, taking a curved or straight course and avoiding the central area of the cornea. According to Velhagen they often form anastomoses and vascular arcades. This type of vascularization permits differentiation of this disease from syphilitic keratitis even after many years of inactivity.

The vascularization attributed to the lack of riboflavin is an extension of the normal limbal vascular system to the cornea. From the pieces of the existing limbal loops, fine vessels run more or less toward the cornea. These "streamers" in turn anastomose with one another to form other loops from which more streamers and, in turn, loops may be formed. The normal cornea may thus become increasingly vascularized.

These vessels run superficially, immediately under the epithelium and are of such caliber that they are usually invisible even with ordinary binocular loupe. With the corneal microscope and slitlamp, they show best when observed with light reflected from the iris and they may readily be overlooked with direct corneal illumination.

Frequently the vessels are so engorged with blood that they appear to stand out from the surface. They are mostly subepithelial but, when opacities are present in the cornea,

the blood vessels may penetrate the substantia propria.

In late cases, the deeper vessels may form a plexus within the endothelium. Iritis rarely occurs and the deeper layers of the eye are not involved.

In chronic relapsing cases, there may be a complete vascularization and extensive superficial corneal opacities. It is possible that many of the forms of superficial and interstitial keratitis may be associated with riboflavin deficiency.

The etiology of acne rosacea and rosacea keratitis still remains unsolved. The belief held by some that riboflavin deficiency is a cause, has not been clinically substantiated in the experience of many ophthalmologists.

It has been suggested that a glandular and metabolic disturbance associated with some form of allergy may be the underlying cause. Keratitis rosacea appears to be a disease of hypersensitivity in at least some cases with the eyes serving as a shock tissue for allergic reaction.

In keratitis of acne rosacea a few thick vessels may invade the subepithelial corneal infiltrates and may be embedded in the deeper tissue. Often the vessels may invade clear corneal tissue which lies ahead of the infiltrates or ulceration. This is a characteristic feature of the disease.

In the fascicular variety of phlyctenular keratitis, the blood vessels invade the cornea just behind the phlyctenules and do not involve the cornea, which is clear. Vessels which go beyond the margin of the ulcerated area may also be seen in rodent ulcer of the cornea. It is difficult frequently to differentiate rodent ulcer from ulceration associated with keratitis rosacea.

Tonometer readings

Dr. Francis Heed Adler said that, if the tonometer gives several different readings on successive applications, it is impossible to tell which is the correct reading. It is obvious that something is wrong and, in the majority of cases, it is with the tonometer. It is assumed that the tonometer is a certified instrument, and that no ophthalmologist would own an instrument which was not certified.

The most common cause of an instrument not functioning is that the instrument is dirty. Every tonometer should be cleaned after it is used, and the directions for doing this have been issued by the Committee on Tonometry.

If the tonometer is in good working order there may still be variations in the readings due to the following causes:

(1) The patient may be squeezing. Not only must care be exercised that the patient does not contract the orbicularis muscles and the associated facial muscles for closing the palpebral fissures, but that the patient is actually relaxed, as co-contraction of recti muscles can pull the globe back into the orbit in such a manner as to compress the globe against the orbital fat and raise the intraocular pressure. No reading should be accepted unless it can be ascertained that the patient is relaxed.

(2) The second common cause for variations in readings is the lack of a fixation mark so that the plunger of the tonometer is not exactly vertical over the cornea.

Glaucoma and exfoliation of lens capsule

Dr. Milton Berliner said that only a certain percentage of the cases exhibiting exfoliation of the superficial lamellae of the hyaline lens capsule develop glaucoma. Exfoliation is not as rare as was previously thought and can be seen not infrequently provided we take the trouble to dilate the pupils in aged individuals.

It is still uncertain whether the ensuing glaucoma seen in some of these cases results totally from an actual clogging of the angle by particles of the exfoliative material or whether some other cause is basic.

Dr. Berliner said that he believed that, fundamentally in this condition, we are dealing with a degenerative process involving the glass-membrane system of the eye. There is

a possibility that Descemet's membrane, the hyaline lens capsule, the zonule, and the lamina vitrea (Bruch's) of the choroid forms a continuous system.

There has been some evidence brought to light showing that the zonular fibers practically all terminate at the flat portion of the ciliary body; that they do not attach to the internal limiting layer but actually pass between the cells of the ciliary epithelium to join the basement membrane. If this is true, the glass membranes would form a continuous system.

The physiology and function of the glass membrane is still not understood. In several cases of exfoliation, Dr. Berliner said he had found associated with it other degenerative processes of the glass membranes; for example, drusen of the lamina vitrea and Descemet's membrane. In addition, after iridectomy, whitish deposits have been seen on the zonular fibers themselves.

Disease or degeneration might lead to increased permeability between the vascular choroid and the overlying retina and vitreous. This conceivably may play a greater role in the production of glaucoma than we think at the present time.

Also, weakness of this glass-membrane system (capsule-zonule-vitrea) could permit more easily the forward displacement of the ciliary body and lens and, consequently, narrowing of the chamber angle.

In conclusion, Dr. Berliner stated that his interpretation of glaucoma in the presence of exfoliation of the lens capsule is that it might not entirely arise from a mechanical blockage of the angle spaces by the exfoliated particles but that it is also related to a more widespread degeneration of the entire glass-membrane system with consequent changes in circulatory permeability and support.

Horizontal concomitant strabismus

Dr. Hermann Burian said that the etiology of concomitant strabismus is complex. It may seem impossible to disentangle, in an individual case, the factors causing the strabismus. Nevertheless, it is highly desirable to direct the diagnostic investigation toward establishing the etiologic factors involved in each case.

Only in this way can a rational treatment be instituted, since it is the fundamental therapeutic principle that surgical intervention will never directly influence the innervational factors responsible for a strabismus and that nonsurgical treatment can never permanently change the position of the eyes.

We should therefore, insofar as possible, attempt to differentiate the innervational and noninnervational factors. The one outstanding innervational factor, the accommodative factor, is of course, well known and it is elementary that one should always determine carefully the refractive error and the influence of its correction, both short term and long range, on the position of the eyes.

Dr. Burian then said that repeated tests and prolonged observation of each case is essential in the etiologic diagnosis. The reason for this is that it is typical of innervational cases, or of cases with a large innervational component, that the angle of squint is very unstable. This instability is seen both in individual tests made at a certain time and in comparing the results of the same test made at different times. A very stable angle of squint points to noninnervational factors. In such cases occlusion, for instance, is of little effect.

Avitaminosis and ocular lesions

Dr. Arthur Yudkin said that the clinical diagnosis of early vitamin deficiency is often difficult to make, particularly when physical findings are absent, or when the lesion is superimposed on conditions created by chronic deficiencies. The symptoms may be modified by the presence of some constitutional disturbance such as diabetes. The subjective manifestations which occur in persons with subclinical avitaminosis are frequently those ascribed to neurasthenia. It is possible that both conditions may be present and require treatment.

It is apparent from experimental investigation that there is some interrelation of vitamin activity. In many cases, the deficiencies are multiple, and treatment of the predominant deficiency with a single factor of the complicated vitamin may disclose other deficiencies which have previously been masked.

It has been demonstrated that certain conditions, known as conditioning factors, raise the requirements for essentials above the basal level. Some of the important factors are those of physical exertion, exposure to light, and exposure to toxic substances. These factors alone or together do not necessarily produce deficiency states but they may easily influence the introduction of a deficiency condition in a susceptible body.

It has been demonstrated that vitamin A is essential for the maintenance of the cell structure of various epithelial cells of the eye, skin, respiratory tract, gastro-intestinal tract, and genito-urinary system. The normal epithelial cells are subject to pathologic changes in vitamin-A deficiency and these changes are characterized by an atrophy of the epithelium and the cells are replaced by proliferation of basal cells which in turn become keratinized.

Vitamin A has been found as a component of visual purple in the rods of the retina. Thus, vitamin A may assume an extremely important role in the physiology of vision. There may be some relationship between the color thresholds, poor dark adaptation, and avitaminosis.

Vitamin-A deficiency has been described in the face of an adequate intake in persons with biliary obstruction or other conditions in which fat digestion is disturbed. It is unusual to see frank cases of keratomalacia or even milder ocular disturbances attributed to vitamin-A deficiency, such as Bitôt's plaques or pigment changes in the conjunctiva.

Night blindness has been found in a number of diseases which affect principally the retina and the optic nerve. Retinitis pigmentosa is an outstanding example. Prolonged exposure to strong light, diseases of the liver with jaundice, and some cases of high myopia are also sometimes characterized by night blindness.

Yet vitamin A alone has in many instances, failed to cure night blindness, and it was found necessary to supplement a well-balanced diet and vitamin-A products with large quantities of vitamin-B complex obtained principally from liver and yeast. Retinitis pigmentosa, having night blindness as an outstanding symptom, has not as yet been cured with large amounts of vitamin-A products and supplements of vitamin-B complex.

Recently it has been shown that some types of conjunctivitis and keratitis require a supplement of niacin to relieve the ocular inflammation. There are some forms of ocular disturbances such as marginal ulcer, dendritic ulcer, and interstitial keratitis, that do well when only vitamin-B complex is given.

Severe ulcers of the cornea have been treated successfully by intravenous vitamin-C therapy. Because the normal lens has considerable vitamin C in it, the suggestion has been made that large amounts of vitamin C be given to bolster the dwindling metabolism of the lens when a cataract is present.

Diagnosis of divergence paralysis and divergence excess

Dr. Francis Heed Adler said that divergence paralysis is diagnosed by a homonymous diplopia which increases as the testing light is carried from near to far. But the angular separation of images remains the same at any one distance when the fixation light is carried laterally to either side. This rules out paralysis of a lateral rectus.

Divergence paralysis is a real entity and speaks for the presence of a divergence center. Dr. Adler said that he did not see how it is possible to explain cases of divergence paralysis on any other basis.

If they are not due to paralysis of a center controlling divergence tone, they must be due to spasm of the convergence mecha-

nism and, since in cases of divergence paralysis we frequently find insufficiency of convergence, this possibility would seem to be ruled out. Dr. Adler said he did not see how it was possible to have spasm of convergence and insufficiency of convergence at the same time.

Divergence excess is diagnosed by the presence of an exophoria which is greater for far than for near. The definition has been given in a recent textbook on strabismus quite different from this, which is erroneous. Dr. Adler said that some authors deny the existence of this entity, but he felt that it is a useful concept.

Etiology of a cataract on morphologic evidence

Dr. Milton Berliner said that it is possible in some cases to determine the etiology of a cataract on morphologic evidence.

Cataracts can be classified into two great divisions, developmental and acquired. The lens is the one organ of the eye which has growth and development throughout life. This growth is not continuous but rather by spurts, punctuated by quiescent periods. Similar to the growth rings of trees, the evidence of this is demonstrated by the zones of discontinuity seen biomicroscopically.

Consequently, developmental or hereditary opacities may appear at any time during life, the final one being the senile cataract. Acquired opacities can also occur at any time —that is, congenitally or later—and may arise from endogenous or exogenous causes. Any or every pathologic condition occurring with the eye itself may be a potential cause leading to endogenous cataract.

On the other hand, in the absence of any demonstrable pathologic change within the eye, cataract (exogenous) may be associated with a host of other conditions, for example, radiation, endocrine, drugs, metabolic, and so forth.

The morphologic appearance of cataract depends more on the temporal factor (and on the intensity of causing element) than on whether the etiology is developmental or acquired.

It appears that, at a given time of its life, the lens will react (cataract) to insult in the same pattern no matter what the nature of the offender is. For example, in the young, diabetes tends to produce a complicated cataract (subcapsular punctate opacity) typically exogenous in appearance; whereas, in the aged, the resulting cataract is similar to an ordinary senile cataract.

Zonular cataract may be hereditary or may result from tetany. Trauma may cause a similar phenomenon. Instances of this are too common to mention. Undoubtedly many of the so-called congenital cataracts may not be developmental but acquired. In the case of hereditary (ideokinetic) developmental cataracts, the morphology may be suggestive but we are on firmer ground when we have the proof from a complete pedigree.

Operation in horizontal concomitant strabismus

Dr. Hermann Burian said that the choice of surgery on the horizontal muscles is often based on the behavior of horizontal vergence movements in a patient. Generally speaking, we are told that the internal rectus muscles should not be weakened if convergence is deficient, but that they may be weakened if convergence is normal or excessive. Contrariwise, we should strengthen the lateral rectus muscles if divergence is excessive.

This way of presenting the problem would imply that it is the strength or weakness of the muscles involved which is responsible for an excess or an insufficiency of one of the horizontal vergence movements. However, such is not the case.

Not only is it well known that the horizontal muscles in themselves are never too weak to perform one of the vergence movements or overly strong in producing an excess vergence movement.

It is also well known that, even in cases of extreme convergence insufficiency, for in-

stance, the medial rectus muscles are invariably strong enough to perform a normal adduction of each eyeball.

In deficiencies or excesses of the vergence movements, the muscles are capable, as a rule, of acting normally. What is excessive or deficient is the innervation.

Now the innervational factors leading to anomalies of the neuromuscular apparatus of the eyes are, in themselves, not accessible to surgical treatment. One should therefore not base one's decisions regarding surgery of the ocular muscles on the behavior of convergence and divergence.

The diagnostic signs in horizontal concomitant strabismus on which one should base one's decisions regarding surgery are concerned with the ductions (rotations) of the eyes rather than with the vergences. The normalization of the horizontal rotations of the eyes should be the goal of ocular muscle surgery.

In the diagnostic examination, one should pay special attention to excessive or deficient adduction and excessive or deficient abduction of one or both eyes, and orient one's surgery accordingly.

Using these diagnostic signs as a guide, one will find the most satisfactory surgical therapeutic measures. The magnitude of the angle of squint, as such, plays only a relatively minor role in the decision as to the type of surgical procedure to be chosen.

If, in the preoperative diagnostic examination, attention is paid to the behavior of the ductions, that is the rotation of the eyes, one will hardly ever find it necessary to change one's decision when the patient is on the operating table. In fact, after an appropriate examination, one should not let oneself be influenced in one's therapeutic procedure by findings on the operating table, unless they are entirely out of the ordinary.

EYE SYMPTOMS IN TOXOPLASMOSIS

DR. ARTHUR YUDKIN said that, in a minority of cases, this disease has an acute onset. In such cases the signs are those of irritation as the result of either meningitis or encephalitis. Such patients have an elevation of temperature, stiff neck, tremor, and spasms of the extremities which develop into convulsions. As the acute disease subsides, neurologic signs tend to become prominent.

In addition to ocular signs, which include loss of vision, chorioretinitis, microphthalmos, strabismus, and nystagmus, there are extremely variable neurologic signs in the subacute and chronic disease. The hydrocephalus may progress. There may be continuance, or later appearance, of generalized or Jacksonian convulsive seizures or petit mal attacks. Brain stem involvements may account for nystagmus, strabismus, hemiplegia, or spastic paraplegia. Varying degrees of mental and physical retardation, speech impediment, and emotional disturbance are seen.

In adult toxoplasmosis, the lesions in the central nervous system are minimal as compared with those in the infantile disease. The clinical symptoms usually fail to indicate central-nervous system involvement.

The diagnosis is suspected when a patient who has had convulsions, is found to exhibit chorioretinitis and cerebral calcification. This triad seemingly is almost pathognomonic of the disease. There is nothing characteristic about the convulsions and, since convulsions occur so frequently during infancy, they are by themselves not important. Cerebral calcification occurs in a variety of disease states, as does also chorioretinitis. The chorioretinitis of toxoplasmosis varies within wide limits. It is the combination of these signs that points to the diagnosis.

Bernard Kronenberg,
Recording Secretary.

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CORTISONE IN OCULAR TUBERCULOSIS

A recent editorial in the *Journal of the American Medical Association* calls attention to possible dangers incident to the use of cortisone in patients with tuberculosis. Such caution was first issued by Michael and his co-workers in Emory University, and was suggested by certain animal experiments which indicated the administration of cortisone depressed the formation of oil-induced peritoneal exudate, which they believed was an index of a decreased cellular response and might well parallel resistance to tuberculosis. Later Spain and Molomut reported a series of experiments in tuberculosis-resistant rats, which experiments indicated that the continued use of cortisone depressed the natural immunity, permitted the tubercle bacilli to grow more rapidly, and to produce more diffuse lesions. Still more recently Lurie and his associates have reported experiments which indicate cortisone may fundamentally and markedly affect the essential mechanism of the pathogenesis of tuberculosis. Thus in pulmonary infection produced

by inhalation infection, four times as many tubercles developed in the lungs of cortisone-treated rabbits as in the untreated controls. The caseation in the tubercles was greatly increased with tubercle bacilli swarming in the lesions, although their dissemination in the tracheo-bronchial lymph nodes was less than in the controls which showed spreading interstitial tuberculous granulomas, in which the bacilli were much less numerous.

Recent, as yet unreported, experiments in the Wilmer Institute on the effect of treatment with cortisone on the development of ocular tuberculosis appear to support the above findings. In immune-allergic rabbits under prolonged treatment with cortisone, the secondary ocular tuberculosis was characterized by soft caseous tubercles with great numbers of bacilli and no evidence of fibrosis. While the cortisone appeared to control the external evidences of inflammation, when the administration of the hormone was stopped, some rabbits showed a sudden rebound phenomenon, with an abrupt return of acute inflammation and a rapid spread of the bacilli in the eye with the formation of fresh lesions.

Cortisone and ACTH are now being used somewhat extensively in the treatment of ocular tuberculosis, and it is well recognized that their use is usually quickly followed by a control of inflammation and often an apparent circumscription of exudates and acute lesions. The natural course of the disease appears profoundly altered. It was believed that this early inhibition of inflammation might well be beneficial and control a local tuberculous focus until such time as streptomycin together with some adjuvant might exert a truly bacteriocidal effect.

In the light of these recent experimental findings, it may be necessary to revise our thinking on the use of cortisone and probably ACTH in ocular tuberculosis. It is recognized that the adrenocorticotrophic hormones may affect fibrosis and encapsulation which is probably the essence of bacteriostasis in tuberculosis. That these agents might have a more profound effect and alter the mechanism of the pathogenesis was, however, not expected. The question may well be asked if the alteration in the natural course of the disease which follows cortisone therapy will ultimately be beneficial to the patient. The whole question is in urgent need of further exploration. Until such time as the situation is clarified, ophthalmologists may well be advised to use ACTH and cortisone with extreme caution in ocular tuberculosis. This same warning probably is pertinent to the topical use of cortisone, where the local concentration of the agent may well be as high, or higher, than is obtained by parenteral injections.

Alan C. Woods.

OPHTHALMOLOGISTS AS PSYCHOLOGISTS

As was mentioned in the review of *The Adjustment of the Blind* by Hector Chevigny and Sydell Braverman (Am. J. Ophth., **33**:1807 (Nov.) 1950), the authors discuss the subject of ophthalmologists as psychologists at some length with severe condemnation for the ophthalmologist. The implication in the sentence, "In the large cities, such as New York, ophthalmologists usually turn over their medical and surgical failures at once to the social agencies for future guidance," would seem to be that the blind handled by an ophthalmologist are predominantly blind through his fault. This editorial is not written to justify the psychology of the ophthalmologist, but rather to present the subject dispassionately with a view to stimulating a discussion of the whole subject by ophthalmologists and psychiatrists.

The authors of *The Adjustment of the Blind* believe that not enough attention has been paid to this subject by ophthalmologists and state that they have nowhere found courses listed in the curricula for ophthalmic students on the psychology of blindness. The ophthalmologist's professional interest in the patient destined for blindness does in

truth end when the patient becomes blind. This, however, does not mean that the life of this now blinded individual has not been materially affected and his future tremendously influenced by his handling by his ocular physician. The question then arises whether or not this has been carried out intelligently.

The oculist is surely in danger of neglecting the psychological side of the case for several reasons. In the first place, his extreme interest in the ocular condition absorbs his attention; secondly, his struggle to overcome the pathologic process occupies his time to the exclusion of the rather prolonged study necessary to understand the temperament of the individual, his environment, and his family, which is necessary to enable him to treat the mental problem effectively; thirdly, there is often a lack of understanding of the psychology of blindness and of the blind because of failure to have studied the subject. This leaves the physician dependent on what he calls "common sense."

Sight is such an elemental necessity that the loss of it, or even the threat of loss, produces in the patient a fundamental fear. Severe pain, which is at times an accompaniment of visual loss, may reduce the individual to primitive reactions. Familiar as he is with patients who are en route to blindness, the doctor may not appreciate the existence of these factors and may overlook them in the given case and, by having become accustomed to a repeated situation, fail to realize the shock to the personality of the individual who must thereafter completely revolutionize his life and thinking.

Let us now consider how the ophthalmologist prepares, or fails to prepare, his patient who is on the way to becoming blind. The two authors quote Mary Campbell by writing that "in her opinion, 85 percent of those blinded through disease encounter adjustment difficulties afterward because of unwise psychological handling by the physicians." It is stated in *The Adjustment of the Blind* that "it is interesting to note that the accidentally blinded, although their shock should be the greater because it is relatively unexpected, generally show a markedly better disposition to reorganize socially and physically."

An interview with 32 ophthalmologists by Frederick Bentley indicated that 17 of them said that they did not predict the probable outcome until the situation was clearly beyond medical or surgical repair. Quoting further, "Of the remainder, 11 said that they told unwelcome truths to prepare the patient for eventualities, if they judged the person able to stand it." Chevigny and Braverman contend that knowing the truth is far less upsetting to the personality and interferes less with the future adjustment to blindness than does the anxiety associated with uncertainty. Their thesis is that the patient should be prepared for an unfortunate outcome and, if this does eventuate, he will adapt himself much more quickly to blindness. Again I quote, "Only by the rule of telling the truth can the eye surgeon make the best guess for the safety of his patient."

Objections to this policy seem fairly obvious, but are not mentioned by the writers. The child surely does not have an adequate background for such explanations and many old people have a loss of perspicacity and other senile changes, perhaps even death impending within the not too distant future, that render them happier to retain hope of restoration of vision as long as possible rather than to attempt an eleventh-hour adjustment. Then, too, there are the stout objections of the family who are usually responsible for the care and welfare of the patient. Invariably the son or daughter who leads the mother or father to the physician's office when, for example, retinal degeneration or optic atrophy has progressed to a stage approaching blindness, instructs the ophthalmologist not to tell the parent how serious is his or her condition. Evidently sons and daughters also usually err in the psychology of blindness because most are firmly convinced (and I might almost say

"all") that the beloved parent will be far happier with hope of vision than if told that he must prepare for blindness.

It will readily be conceded that a radical readjustment will be necessary in any but the senile blind if a happy and successful life is to be achieved, and that in such cases in which blindness is certain it is better to prepare the patient for this. But, to adopt a defeatist attitude while there is still hope and to communicate this to the patient would almost surely depress the patient terribly and militate against his making a good fight which is so important for recovery.

The subject is undoubtedly controversial. There are good arguments on both sides. Surely the ophthalmologist does not know as much of the psychology of the individual as he should know. It is also true that he would handle his patients better if he knew more. Courses in psychiatry applied to such problems as blindness would be valuable additions to the training of ophthalmologists. A few discussions of these subjects might be good material for the programs of some of our national meetings.

Lawrence T. Post.

CORRESPONDENCE

Foreign-body sensation due to conjunctival concretions

Editor,

American Journal of Ophthalmology:

Foreign body sensation in the eye is one of the most common symptoms with which the ophthalmologist is confronted. When there is an obvious cause, the treatment is specific and efficacious. Often, however, when no such specific cause is at hand, the presence of conjunctival concretions leads him to consider whether these should be removed. Conversation with other ophthalmologists and a reading of the available literature have made me aware of a certain haphazardness in the treatment of conjunctival concretions.

Concretions may follow chronic inflammatory conditions of the palpebral conjunctiva, or they may represent a senile change. They are "products of cellular degeneration retained in small depressions and tubular recesses in the conjunctiva."* There may be few concretions or many. Both Duke-Elder and Berliner in their texts mention the irritation of the eye which occurs when the concretions project from the surface of the conjunctiva.

I should like to draw attention to a test which may not be routinely employed in these cases, but which will be found useful in determining whether any of the concretions under suspicion are actually symptomatic.

Solution of fluorescein is dropped into the conjunctival sac of all patients with concretions whose symptoms cannot be otherwise explained. Those concretions, one or many, which stain a bright green as a result of overlying conjunctival erosion are producing symptoms and should be picked out with the aid of a sharp needle.

(Signed) Victor Goodside,
New York, New York.

Localized sensitivity to penicillin

Editor,

American Journal of Ophthalmology:

Dr. Egan's interesting case report on localized sensitivity of the eye to penicillin, which appeared in the February, 1951, issue of the Journal, brings to mind another incident of this rare situation.

My patient was a 55-year-old man who consulted me in 1945 about a stye on his left upper lid. I prescribed hot compresses and penicillin ointment, which had just appeared commercially at that time. Within 24 hours, the stye had ruptured but the skin of the lid was greatly inflamed and swollen.

* Duke-Elder, W. S.: Textbook of Ophthalmology. St. Louis, Mosby, 1938, v. 2, p. 1747.

Penicillin was discontinued but the lid did not assume its normal appearance for a week.

One year later the patient was hospitalized for a bladder infection and received from his urologist an intramuscular injection of 100,000 units of penicillin. Within 24 hours the same left upper lid became inflamed and swollen and had all the appearance of penicillin sensitivity without any evidence of hordeolum. This subsided after a week, no more penicillin being given. There was no evidence of penicillin reaction at the site of injection. No penicillin had been used on the eye.

(Signed) Edwin B. Dunphy,
Boston, Massachusetts.

BOOK REVIEWS

L'ANNÉE THERAPEUTIQUE EN OPHTALMOLOGIE (Yearbook of Ocular Therapeutics). Edited by G. E. Jayle and A. Dubois-Poulsen. Paris, L'Expansion Scientifique Française, 1950. Volume 1, clothbound, 416 pages. Price: 1,600 francs.

Felicitations are due the French for a new type of publication—an annual review of ophthalmic therapeutics—intended to help the clinician and investigator keep abreast of the rapid developments that characterize modern ophthalmology. In this first volume, which is entirely in French, there are 24 French contributors, two American (Otto Barkan on goniotomy and A. E. Braley on epidemic keratoconjunctivitis), and one from Italy, Switzerland, and Belgium, respectively. Practically every article is documented with a full bibliography. The next annual will consider new subjects and contain a detailed index of the two volumes.

For ocular syphilis Bessiére favors a combined treatment with penicillin, bismuth, and arsenic, and advises for interstitial keratitis daily subconjunctival injections of penicillin in addition. Bietti holds that tuberculin is required to combat the allergic status in ocular tuberculosis but the focus can be simultaneously attenuated by the bactericidal drugs —streptomycin, thiosemicarbozene, and para-aminosalicyclic acid. The feebler methyl antigen has the advantage of not provoking local, focal, or general reactions.

In the therapy of retinal vein thrombosis Bonacour stresses the anti-infective and anticoagulant drugs as well as those maintaining capillary integrity and vasodilatation. A rapid and marked vasodilatation is safely obtained by the retrobulbar injection of 25 to 50 mg. niacin in procaine solution. Intravenous sodium nitrite is not mentioned but should be particularly effective in reducing retinal edema as it causes venous dilatation with constriction of arterioles. The "ironic pessimism of Derrick Vail" regarding Filatov's tissue therapy is apparently not shared by the French as evidenced by Deodati's considerate review of 110 references.

Dollfus believes that beta radiation is not much superior to either X rays of low penetration or Bucky rays. Dubois-Poulsen and Cragné treat the hyphemia following cataract surgery by intravenous injections of 10 cc. of 20-percent sodium citrate which they maintain arrests hemorrhage and favors absorption. These are given slowly every other day. In herpes zoster ophthalmicus, Farnarier finds massive doses of thiamin of value if given early—250 mg. daily, intramuscularly. Jayle is enthusiastic about the efficacy of perilimbic mucous-membrane grafts in stubborn forms of trachoma, interstitial keratitis, and ulcerous keratitis.

The treatment of allergy, trachoma, iritis, eczema, herpes, keratitis, and scleritis are also reviewed; and special articles are devoted to physiotherapy, antibiotics, and vitamins. The volume is replete with stimulating novel and rational ideas of therapy which are surely worth trying especially in baffling cases that resist standard procedures.

James E. Lebensohn.

BULLETIN DE LA SOCIÉTÉ BELGE D'OPHTALMOLOGIE. No. 93, November 27, 1949.

Lebas and Hubert demonstrate the case of a man who had had an epithelial graft to the left conjunctival sac some 15 years before, following an injury. They also present a case of limbal nevocarcinoma treated many times by diathermy coagulation with a final very good result in spite of the numerous coagulations.

Jean-Marie Habig discusses localization of a metallic intraocular foreign body by means of the Berman locator.

L. Weekers, R. Weekers, and J. Dedoyard show four cases of transient hypotony and myopia following trauma. They believe the hypotony comes from vasodilatation of the uveal tract, and modifications of the constitution of the aqueous humor, and that the myopia is lenticular.

L. Alaerts believes that the hypertension of chronic glaucoma is due to an increase in the volume plus trouble with the capillary permeability, resulting in decreased passage of the fluid

D. Hoorens advised instillation of pilocarpine instead of eserine when miosis is desirable following a cataract extraction that was preceded by a retrobulbar injection of novocaine. In glaucomatous eyes he advocates the instillation of both pilocarpine and eserine before surgery, if a retrobulbar injection is to be done.

J. François points out that the Elliot trephining operation is very similar to an iridencleisis, in that iris or ciliary body is usually incarcerated in the wound and he discusses this at some length.

Dr. J. Zanen presents a case of essential progressive atrophy of the iris and choroid, the etiology of which remains a mystery.

A. Fritz discusses the use of a contact lens sutured in place in cases of perforated wounds of the cornea, paracentesis of the cornea, and keratoplasty.

J. François and L. De Baets discuss the significance of papilledema in tuberculous meningitis. They found changes in the optic nervehead in 62 of 98 patients, simple hyperemia in 12, edema in 36, and paleness of the nerve in three. The papilledema was unilateral 20 times, sometimes becoming bilateral, but always more pronounced on one side than on the other. It is sometimes localized to one sector of the edge of the disc. The edema has a pale tint, the veins are not dilated, and hemorrhages are exceptional. In none of the cases was there any increase in intracranial pressure. After streptomycin therapy, the papilledema finally disappeared, and the choroidal tubercles became scarred and pigmented.

Lebas and Hubert describe a 10-year-old girl who had been treated for basilar meningitis with streptomycin and who had developed a bilateral simple optic atrophy of the primary type. She soon became totally blind.

M. Appelmans, J. Michiels, J. Delfosse, and E. Van Assche found that subconjunctival injections of streptomycin in tuberculosis of the anterior ocular segment were efficacious in new lesions of the anterior segment and of less value in old lesions.

R. Portray and P. Danis present a case of renal neuroblastoma with unilateral proptosis in an infant one and one-half years of age, who died two and one-half months after the symptoms occurred.

J. François and A. Haemers report the first case of an orbital osteoperiostitis due to colon bacillus infection. J. François, J. Kluyskens, and M. Rabaey describe a case of Bowen's disease which they treated with radiation, giving 515 r each session for 10 different treatments, giving a total of 5,150 r, with good results.

L. Weekers, R. Weekers, and A. Heintz discuss the conservative treatment of glaucoma. They prefer a nonperforating cyclodiathermy to an alcohol injection into the orbit, iridencleisis, posterior sclerectomy, and posterior scleral cauterization. They make about 30 applications of the electrode, each of about 15 seconds' duration and 100°C. They use penicillin ointment and a

bandage is applied and left for 48 hours.

Zanen and Rausin describe a case of hyaline formations on the posterior corneal surface due to obstetrical trauma in an 11-year-old girl.

A. Fritz presents two cases of corneal transplantation which showed partial displacement of the graft after surgery, which were controlled by the use of a contact glass. J. François and A. Philips describe a pupillary constriction to adrenalin, slight dilatation with atropine, no reaction from cocaine, and normal constriction with eserine in an eye with unilateral parenchymatous keratitis.

Hubert and Lebas describe an epidemic of acute follicular conjunctivitis in 47 patients which occurred in 12 days. Treatment consisted of argyrol and cauterization with silver nitrate. Penicillin and sulfa drugs were ineffective.

Bennett W. Muir.

BIOMICROSCOPY OF THE EYE. By M. L. Berliner, M.D. New York, Paul B. Hoeber, Inc., 1949. Volume II, 738 pages, 1,233 illustrations including 503 in full color, bibliography, and index. Price: $25.00 (or $50.00 for the set of two volumes).

The JOURNAL regrets that, due to inexcusable oversight, this splendid volume has escaped an early review in these pages. It is a masterpiece of the art of printing and complements the excellent issue of volume one that won first prize at a book-makers' association when it appeared in 1943.

Volume one took us through the anterior chamber and gonioscopy. Volume two deals with the iris, lens, zonule, and vitreous. Those who are familiar with volume one will find the same exacting standard of appropriate choice and beauty of illustrations, and a text that is fluent and scientific. This beautiful, entirely American book on slitlamp microscopy compares most favorably with those produced by other authors and nations.

Dr. Berliner's experience and scholarly attainments are reflected on every page. He is particularly good when he discusses the subjects of the iris and the lens, and his chapter on radiation cataract is especially timely in view of the present clinical and experimental interest in this subject.

It is presumed that ophthalmologists who own volume one already have obtained their copies of volume two. If not, no time should be lost in completing the set. Those who have not purchased volume one have the opportunity to obtain the whole set at a bargain rate. In these days of scientific ophthalmology, no one practices without using the slitlamp. These volumes are a necessary adjunct for study and reference. The JOURNAL heartily congratulates the author and the publishers for a magnificent work of art and science.

Derrick Vail.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

1

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Rohen, H. **The microarchitecture of the iris and the ciliary muscle.** Berichte der deutschen ophth. Ges. **56**:176-177, 1950.

The finer structure of the iris and ciliary body of man and other mammals was studied from flat sections, and reconstructed three-dimensionally. For details the reader is referred to a more extensive publication in the Morphologische Jahrbuch for 1950. Peter C. Kronfeld.

Wolff, Eugene. **Notes on normal and pathological ocular pigment.** Tr. Ophth. Soc. U. Kingdom **69**:171-178, 1949.

In any particular tumor cell of a malignant melanoma the granules are the same size but vary in different cells from dust-like to just less than a micron. Larger granules occur in cells which have taken up pigment and are then clumped but also are formed by clumping of autochthonous pigment as the result of cell degeneration. The movement of pigment crystals must be due to a swelling and contraction of the protoplasm of the cell, which pushes the crystals along the tunnels between neighboring rods and cones and then retracts them. (8 figures) Beulah Cushman.

2

GENERAL PATHOLOGY, BACTERIOLOGY, IMMUNOLOGY

Amsler, M. **Autopsy of the eye.** Berichte der deutschen ophth. Ges. **56**:100-102, 1950.

As a valuable adjunct to the routine histologic technique, which has the disadvantage of yielding only two-dimensional sections, requiring mental synthesis, the author recommends binocular microscopic examination of the interior of unsectioned, but suitably opened eyes (after short formalin fixation).

Peter C. Kronfeld.

Camici, A. **The influence of the synthetic antihistaminics on the ocular anaphylactic syndrome.** Ann. di ottal. e clin. ocul. **76**:337-346, Oct., 1950.

Camici found that an antihistaminic such as Dimetina if injected opportunely can prevent anaphylactic shock in rabbits sensitized with normal horse serum. The

shock is most effectively prevented if the antihistaminic is administered daily in small doses during the period when the antibodies are in process of formation. Histamine should be considered the important effector substance in the mechanism of anaphylactic shock. It is thought that the antihistaminics prevent shock, not by anesthetizing the sensory fibers as in the case of cocaine, but by blocking the receptors that are specific for histamine and thus rendering them insensible to the action of this substance. (23 references)

Harry K. Messenger.

Wilder, H. C., and Maynard, R. M. **Ocular changes produced by total body irradiation.** Am. J. Path. **27**:1-20, Jan.-Feb., 1951.

The pathologic changes in the eyes of experimental animals receiving total body irradiation from atomic fission, were similar to those resulting from roentgen radiation. The hemorrhages are attributed to bone marrow depression with thrombocytopenia and to a heparin-like substance in the blood stream. Serous exudates are the result of increased vascular permeability. Septic choroiditis and bacteria in the vessels are manifestations of septicemia. Cataract vacuole formation may be due to the severe anemia, although massive cataract may be regarded as the result of irradiation.

Irwin E. Gaynon.

3

VEGETATIVE PHYSIOLOGY, BIOCHEMISTRY, PHARMACOLOGY, TOXICOLOGY

Bruna, F. **The action of aureomycin on herpetic infections of the cornea.** Boll. d'ocul. **29**:496-510, Aug., 1950.

From a human eye affected by a four-day-old dendritic keratitis, rabbit corneas were inoculated, and after mouse-brain passage, the virus was transferred to 12 rabbit eyes. Three animals were kept as controls; three received, every 24 hours, 40 milligrams of aureomycin per kilogram by intramuscular injection for eight subsequent days. Three more animals were treated by instillation of a 1-percent aureomycin solution for 10 days, and three received the same treatment as the latter, starting, however, 48 hours after the experimental infection. No therapeutic effect was observed on the corneas; mice infected with the same virus died at similar rates whether treated with aureomycin or not.

K. W. Ascher.

Buschke, W., Howard, A., and Siegel, L. **Nitrogen fractions as criterion of preservation of corneal tissue.** A.M.A. Arch. Ophth. **45**:27-31, Jan., 1951.

Quantitative data on nonprotein nitrogen fractions in the tissue may be expected to furnish useful criteria for the state of preservation of corneal donor tissue stored under various conditions. The present report deals with data on total nonprotein nitrogen, ammonia nitrogen and amino nitrogen in stored beef corneas. The possible biologic significance of these observations is discussed.

R. W. Danielson.

Grignolo, A. **Culture of corneal, conjunctival, scleral, and uveal tissue in the chorion-allantois of the chicken embryo.** Boll. d'ocul. **29**:617-637, Oct., 1950.

The fertilized eggs were kept in a thermostat for 10 to 12 days; after that, the inoculated tissues can be observed for 8 or 10 more days. Rabbit-eye tissues, quickly removed after the death of the animal, were transferred into sterile Blank and Collab solution with addition of penicillin, streptomycin and crystal violet. This sterile, isoösmotic, antibiotic and antiseptic medium did not interfere with the growth of the embryo nor the tissue implant. The antiseptic preparation of the chicken egg, the opening of its shell and the insertion of the implant are de-

scribed. After the implantation, a sterile coverglass affixed with paraffin, covers the defect of the eggshell. It is known that animal organisms react unfavorably to heterologous grafts. This reaction is absent during the embryonic stage. Corneal tissue gave the best survival results. The epithelium proliferates vividly and joins the chorion-allantois ectoderm. The corneal stroma also proliferates as does the conjunctiva. Scleral and iris transplants were surrounded by the host tissues whereby the latter penetrates into the iris, producing vessels which contain nucleated erythrocytes. (13 photomicrographs) K. W. Ascher.

Gunther, G. **Measurements of the permeability of the blood-aqueous barrier by means of the fluorescein test of Amsler and Huber.** Berichte der deutschen ophth. Ges. **56**:121-127, 1950.

In the fluorescein test of Amsler and Huber the rate of entry into the anterior chamber of intravenously injected fluorescein is determined by a simple optical method (Am. J. Ophth. 24:10, 1948). Gunther's experiences with the test were essentially the same as those of Amsler and Huber. Five cases of malignant melanomas of the uvea showed increased permeability of the blood-aqueous barrier. The fluorescein test, therefore, does not aid in the distinction between neoplasm and tuberculomas. In several other ocular diseases the barrier was found surprisingly and unaccountably permeable.

Peter C. Kronfeld.

Karpe, G., Rickenback, K., and Thomasson, S. **The normal electroretinogram above fifty years of age.** Acta ophth. **28**: 301-305, 1950.

There is a diminished b-potential in persons over 50 years-of-age which diminishes with increasing age, otherwise there is no definite difference in the age groups. The authors show what they consider normal values in a series of tables. Seventy-four eyes were studied.

Ray K. Daily.

Nastri, F., and D'Ermo, F. **In-vitro action of some usual ophthalmologic drugs and the antibiotic effect of penicillin and streptomycin.** Boll. d'ocul. **29**:638-647, Oct. 1950.

In Petri dishes, agar cultures of white staphylococci were exposed to the action of a penicillin solution containing 20 units per cc., or to a streptomycin solution of 1 : 40,000, and to the same antibiotics with addition of one of the following solutions: atropine, scopolamine, homatropine, pilocarpine, eserine, cocaine, novocaine, adrenaline, collyrium adstringens luteum, zinc sulphate, argyrol, protargol, tannic acid, copper sulphate, dionine, privine, potassium iodide, and rubidium iodide all in concentrations that are used clinically. Controls included physiologic saline solution and the tested drugs alone. None of these altered the action of the antibiotics with the exception of adrenaline, zinc sulphate, and particularly copper sulphate. The latter inhibited the antibiotic action completely. K. W. Ascher.

Rexed, B., and Rexed, U. **Degeneration and regeneration of corneal nerves.** Brit. J. Ophth. **35**:38-49, Jan., 1951.

This is a report of histologic studies of the degeneration and regeneration of the corneal nerves in the rabbit. Incisions varying from 90 to 360° of the circumference of the cornea were made through the stroma down to Descemet's membrane and the sensitivity of the cornea tested from the first day to as long as 6 months. The eyes were enucleated at varying intervals, stained with silver and studied histologically.

The denervated, insensitive areas were always smaller than the full arc of the incision. The central cornea did not become insensitive with incisions of less

than 300°, which indicated extensive branching of the fibers. The corneal reflex could be elicited inside the scar after two to four weeks in young, and after five to seven weeks in adult animals. The regenerating nerves were slow to penetrate the scar but after this they progressed very rapidly. By repeatedly reopening the incision it was shown that the new fibers came from the old severed nerves rather than from the adjacent unsevered nerves. The severed ends of the nerves began to show regeneration within three days and the neurites generally invaded the stroma without regard to previous fiber paths; many of them entered and grew along old Schwann sheaths but many remained naked within the stroma. This absence of directive action by the Schwann sheaths seems to be the greatest difference between regeneration of corneal nerve fibers and the regeneration of peripheral nerve fibers elsewhere in the body.

Morris Kaplan.

Rome, S., and others. **ACTH and cortisone in ocular inflammation, parenteral and local use.** Ann. West. Med. and Surg. 4:799-804, Dec., 1950.

The chief value of ACTH or cortisone is to prevent an acute ocular inflammation from becoming chronic. The only cases of iritis that did not respond to cortisone were those in which the pupil was fixed and not dilatable. Intramuscular ACTH is effective in some cases of chronic granulomatous uveitis. Subconjunctival injection of cortisone is effective in acute iritis and chronic keratitis and helpful in vernal catarrh.

I. E. Gaynon.

Schaeffer, A. J., and Murray, J. D. **Amino acid composition of tissue proteins of the cornea, sclera, vitreous and retina.** Arch. Ophth. 44:833-841, Dec., 1950.

The amino acid composition of the total proteins in the corneal stroma, sclera, corneal epithelium, vitreous and retinal tissue of the bovine eye was determined by the microbiologic assay method. The individual proteins of the corneal stroma and of the sclera were isolated and the amino acid composition of these proteins —mucoid, collagen and elastin—was estimated by the same method. The values obtained were tabulated and compared with the results of other investigators.

John C. Long.

Scuderi, G. **Para-aminobenzoic acid in ophthalmology; preliminary note.** Boll. d'ocul. 29:684-655, Oct. 1950.

This drug has a wide spectrum of pharmacologic effects, comprising antibacterial, antirickettsial, antirheumatic, antiallergic, dermatomelanotropic, spasmolytic, vasodilating and diuretic actions, synergism with penicillin and streptomycin and antagonism to sulfonamid compounds. In the Catania University Eye Clinic, among 250 patients PABA yielded good results in cases of blepharitis, traumatic lesions of the cornea, chemical burns, corneal ulcers, vascular disease and acute congestive glaucoma (9 patients). In the latter disease, intravenous administration was effective within 5 or 6 hours.

K. W. Ascher.

Scuderi, G. **Effect of ultraviolet irradiation on corneal permeability.** Boll. d'ocul. 29:563-570, Sept., 1950.

Into the normal or cataractous eyes of 26 persons, mydriatics were instilled and the pupillary diameter as well as the corneal epithelium were studied at regular intervals. Three days later, the same eyes were given five minutes of ultraviolet irradiation before repetition of the mydriatic instillation and subsequent measurements. The solutions instilled were atropine sulfate 1/1000 percent, scopolamine hydrobromide, 1 percent, "Simpanina sulfate" 2 percent, all with addition

of sodium iodide, pH of 7.4, 6.35, and 6.9 respectively, and freezing point depression minus 0.60. The mydriatics entered the anterior chamber more rapidly in the irradiated eye; three graphs describe the action on the pupils in 12 experiments.

Another series of experiments was performed on eight rabbits by irradiating the right eye for three minutes with Birch-Hirschfeld's lamp and then instilling 1-percent pilocarpine nitrate solution, one drop every two minutes for 14 minutes. Biomicroscopic examination with fluorescein instillation was performed in the fifteenth minute, and ten minutes later the aqueous humor was withdrawn and the nitrate-ion content was ascertained with the diphenyl-amino method. The left eyes of the same animals were subjected to the same manipulations without previous irradiation. The average amount of nitrate entering the anterior chamber was 36 mg. percent for the irradiated and 29 mg. percent for the control eyes. The author ascribes the differences to activation of cell metabolism by ultraviolet light and disturbance of the Donnan equilibrium between epithelium and precorneal film. K. W. Ascher.

Scuderi, Giuseppe. **The P_2 factor, vitamin C, nicotinic acid and ocular hemorrhagic allergy. (Experimental researches.)** Ann. di ottal. e. clin. ocul. **76**:275-288, Sept., 1950.

Scuderi studied in rabbit eyes the effect exerted by these three substances on ocular hemorrhagic allergy, with particular reference to the Sanarelli-Schwartzman phenomenon (severe allergic hemorrhagic reaction occurring in rabbits previously sensitized by an injection of Proteus filtrate). The P_2 factor (defined as the disodium salt of the disulfuric ester of 4-methylesculetol and said to protect the permeability of the capillaries) attenuates the phenomenon whether injected before or after the sensitizing injection. Its inhibitory action is even greater if vitamin C is injected along with it. The phenomenon is completely inhibited if P_2 and C are injected intravenously some hours after the sensitizing injection. Nicotinic acid, if injected intravenously before the sensitizing injection, inhibits the phenomenon but was found to be without inhibitory effect if injected into animals already sensitized. The biologic and pharmacodynamic properties of these substances are discussed, and hypotheses are suggested to explain the mechanism of their action. Harry K. Messenger.

Steen, Emil. **Acute experimental toxoplasmosis treated with aureomycin.** Acta Path. et Microbiol. Scandinav. **27**:844-850, 1950.

Aureomycin is effective in the treatment of acute toxoplasmosis in white mice but does not kill the toxoplasma. The mice remain carriers and are immune to new infection. The drug is effective within 48 hours after treatment is begun.

Irwin E. Gaynon.

Woods, A. C., and Wood, R. M. **The action of ACTH and cortisone on experimental ocular inflammation.** Bull. Johns Hopkins Hosp. **87**:482-504, Nov., 1950.

In a series of seven experiments the eye was used as an organ in which to study the effect of ACTH and cortisone on the course and progress of inflammation. Cortisone and ACTH injected parenterally block the inflammation and exudation which occurs in the eye as a reaction to protein anaphylactic hypersensitivity and to bacterial allergy and to the focal reaction in tuberculous eyes. They also block effectively the inflammatory reaction produced in the eye by glycerin and jequirity infusion. Cortisone injected locally in the anterior chamber has an immediate but temporary effect in blocking the inflammatory phase of the protein anaphylactic reaction in the eye,

and the inflammatory reaction secondary to the anterior chamber injection of glycerin and jequirity. The accumulated clinical and experimental evidence of the effect of cortisone on ocular inflammation suggests that its effect may be due to a direct action on the local mesenchymal tissue. (12 figures) H. C. Weinberg.

4

PHYSIOLOGIC OPTICS, REFRACTION, COLOR VISION

Bender, M. B., and Krieger, H. P. **Visual function in perimetrically blind fields.** Arch. Neurol. and Psychiat. **65**: 72-79, Jan., 1951.

Eleven patients with normal fundi were studied who showed visual field defects by standard perimetric methods. A one degree white target at 330 mm. under 7 f.c. illumination was used. There was in each case a lesion in the optic pathways. These patients were retested in total darkness except for a pinpoint red fixation light and the luminous target. The target subtended 20 minutes to 6 degrees. The source of light was a clear bulb behind a milk glass screen, the intensity of which was under control. When the anopic regions were examined under these conditions the patient was able to see the luminous target at threshold values, differentiate changes in its intensity, perceive movement and localize its position, appreciate flicker, and report after-images. The reactions were gross and showed much fluctuation. A perimetrically blind area is hence not necessarily an area of complete loss of function.

James E. Lebensohn.

Berger, Curt. **Experiments on the legibility of symbols of different width and height.** Acta ophth. **28**:423-434, 1950.

In a former investigation Berger found that the effect of the horizontal distance between the outer borders of the letters was not the same for different symbols, and that there was no proportionate increase of legibility with increasing width of symbols. The data of this study show that the effect of increasing height is very similar for all symbols and that their visibility increases slightly less than proportionately to the increase in height of the symbols. The author believes that the results indicate that spatial distribution of active units in the fovea centralis is the decisive factor in determining the legibility of symbols. Ray K. Daily.

Bottino, Carlo. **Clinical considerations on the use of contact lenses.** Ann. di ottal. e clin. ocul. **76**:289-296, Sept., 1950.

Contact lenses afford a truly physiologic means of correcting optical defects but should be prescribed only for selected patients, as when marked improvement in vision is not otherwise obtainable or when their use is advisable for occupational reasons or for safety's sake. (16 references) Harry K. Messenger.

Dubois-Poulsen, A., Tibi, A., and Magis. **Variations of the blind spots especially in ametropia, accommodation, binocular fixation.** Ann. d'ocul. **184**:17-40, Jan., 1951.

The authors constructed an instrument which consisted essentially of a Bjerrum screen for use at 2 M. or less with a 5 mm. red fixation light. The size, shape and position of the blind spot may be altered by slight variations of atmospheric pressure, anoxemia and numerous other environmental conditions which affect the pericecal capillaries and bring about marginal angioscotomata. Marked differences were observed in the blind spots of the two eyes. In myopia the blind spots were frequently elongated vertically but unchanged horizontally. Refractive errors had little effect except for slight differences with and without correcting lenses. During accommodation no appreciable differences were noted. With binocular

fixation, enlargements of the blind spots were observed. These were probably of central origin rather than local pericecal vascular angioscotomatas. (References)

Chas. A. Bahn.

Graff, Th. **Subjective measurement of astigmatism.** Berichte der deutschen ophth. Ges. **56**:39-43, 1950.

The author advocates the cross cylinder method with a Stokes' lens.

Peter C. Kronfeld.

Halbron, P., Lapp, C., and Marandon, J. **Reactions of the eyes to mydriatics: theoretical study and application.** Ann. d'ocul. **183**:1009-1015, Dec., 1950.

In this technical contribution, the quantitative and qualitative correlation of absorption and elimination of active and passive mydriatics is presented in graphs which express rather complex mathematical formulae. In persons with dark-colored irides, the absorption and elimination maximum of active mydriatics such as benzedrene and ephedrine is practically twice as long as in pale eyes. With passive mydriatics, such as atropine and homatropine, the difference is much less marked. After instillation of homatropine the maximum absorption period was found to be 23 minutes and the maximum elimination period three hours.

Chas. A. Bahn.

Hallett, J. W. **Amblyopia independent of usual associated conditions.** A.M.A. Arch. Ophth. **45**:64-69, Jan., 1951.

Forty-seven consecutive cases of amblyopia not associated with the usual causes, such as strabismus and anisometropia, were studied. In 32 the amblyopia was bilateral, and in 15, unilateral. Isohypermetropia was overwhelmingly common in the cases of unilateral amblyopia, but no significant type of refractive error was found in the cases of bilateral amblyopia. No case of malingering was encountered among the patients with unilateral amblyopia, but more than half the patients with bilateral amblyopia gave positive tests for visual malingering. In about three fourths of all cases, visual field changes, most commonly concentric constrictions, tubular fields and interlacing color fields, were presented.

R. W. Danielson.

Hardy, L. H., Rand, G., and Rittler, M. C. **Investigation of visual space.** A.M.A. Arch. Ophth. **45**:53-63, Jan., 1951.

The problem of visual space, which differs from physical space, was investigated. It seemed that the determination of the correlation of one of the characteristics of visual space, the constant K. with the mechanical ability of the observer might be of naval importance. Eight empirical methods of studying the visual space of an observer have been formulated. This report deals with the Blumenfeld alley experiments. The results obtained have led the authors, in consultation with Luneburg and Boeder, to conclude that the alley experiment presents insuperable difficulties to practical application. They found the alley experiment inadequate as a test of the personal constants, sigma and K, of an observer's visual space, because of the effect on the results of preconception, experience and judgment habits of the observer.

R. W. Danielson.

Johansen, Erik. **Simple myopia in schoolboys in relation to body height and weight.** Acta ophth. **28**:355-361, 1950.

In 527 boys between 12 and 15 years of age no definite correlation was found between height, weight and myopia. The author suggests that the somewhat greater height of the myopic boys may be significant as a link in a general growth anomaly. (1 figure) Ray K. Daily.

Miles, P. W. **Testing visual fields by**

flicker fusion. Arch. Neurol. and Psychiat. **65**:39-47, Jan., 1951.

Miles describes his method of flicker perimetry in detail. In the 47 patients studied he found the flicker fusion field more sensitive than campimetry, particularly in early cases. In 23 the flicker fusion fields showed changes of localizing value when the standard field was negative. In most patients the flicker fusion fields can be taken in less than 15 minutes. Accurate results may be obtained even from very sick or mentally disturbed patients.

James E. Lebensohn.

Monjé, M. **The utilization time in visual acuity measurements.** Berichte der deutschen ophth. Ges. **56**:47-49, 1950.

The utilization time or effective period of a stimulus is the period over which it must act to excite a given tissue. By projecting Landolt rings onto a screen for accurately measurable short periods of time, the relationships between visual angle of the optotype and utilization time has been determined and found to follow fairly closely the reciprocity law of Bunsen and Roscoe. Changes of the duration of the stimulus are not quite as effective as changes of the visual angle. The brightness of the whole target and of the surroundings of the ring influence the effectiveness of duration changes.

Peter C. Kronfeld.

Santoni, A. **The relation between myopia and corneal opacities.** Ann. di ottal. e clin. ocul. **76**:445-455, Dec., 1950.

Santoni reports three cases of unilateral myopia associated with corneal opacities and finds reason to believe that the myopia is secondary to the keratitis which caused the opacities. Noting that the earlier in life the keratitis occurs the more likely the eye is to become myopic, he suggests that the keratitis may cause myopia by upsetting the balance of the various growth factors of the eye in such a way that the anteroposterior axis is unduly elongated. (17 references)

Harry K. Messenger.

Schulte, D. **Effects of the refractive state upon the size of the blind spot.** Berichte der deutschen ophth. Ges. **56**:43-46, 1950.

The blind spot was measured in normal eyes under the influence of artificial hyperopia and myopia (−6 or +6 diopters added, respectively). The changes in the size of the blind spot were interpreted as due to changes in the size of the retinal images and of the blur circles.

Peter C. Kronfeld.

5

DIAGNOSIS AND THERAPY

Daily, L., Jr., and Daily, R. **A needle to puncture lenses with tense capsules.** Tr. Am. Acad. Ophth. p. 292, Jan.-Feb., 1951.

The tip is directed away from the shaft about 50°, is narrow, round in cross section, and sharply pointed.

Chas. A. Bahn.

Fink, W. H. **Tear sac speculum.** Tr. Am. Acad. Ophth. p. 304, Jan.-Feb., 1951.

The instrument described is constructed on the principle of a lid speculum with a strong spring and 4 or 5 prongs on both blades. Chas. A. Bahn.

Heinzmann, H. **Gonioscopy with the Zeiss-Opton slitlamp.** Berichte der deutschen ophth. Ges. **56**:128-130, 1950.

A contact lens of the Goldmann type with four deviating mirrors is held in place by a bracket attached to the head rest of the slitlamp. A special prism gives proper (slit-shaped) illumination of the lateral angle portions.

Peter C. Kronfeld.

Hildreth, H. R. **An electric coagulator.** Tr. Am. Acad. Ophth. p. 291, Jan.-Feb., 1951.

In a small battery handle the dry cell is connected with a U-shaped wire element which becomes red hot. It is used for stopping hemorrhage, coagulating small conjunctival nevi, and cauterizing corneal ulcers. Chas. A. Bahn.

Leahey, B. D. **A corneal double fixation forceps.** Tr. Am. Acad. Ophth. p. 303, Jan.-Feb., 1951.

This toothed U-shaped forceps holds the corneal suture points more tense, when suturing corneal margins, especially in soft corneas. Chas. A. Bahn.

Leahey, B. D. **A toothed chalazion forceps for marginal chalazia.** Tr. Am. Acad. Ophth. p. 305, Jan.-Feb., 1951.

Two short teeth, slanting slightly backwards on the upper blade, and a corresponding slot in the lower blade prevent sliding of the forceps. Chas. A. Bahn.

Littman, H. **The principles of ophthalmometry.** Berichte der deutschen ophth. Ges. **56**:33-39, 1950.

The author, who is apparently connected with the new Zeiss-Opton plant, has devised a new ophthalmometer that meets the requirements of independence of the measurements from the distance between the ophthalmometer and the cornea as well as from the accuracy of focussing. Peter C. Kronfeld.

Mannis, A. A. **A portable bedside tangent screen.** Tr. Am. Acad. Ophth. pp. 300-301, Jan.-Feb., 1951.

The author has constructed a portable tangent screen measuring 17″ × 23″ which rests on a stand. It is made of black felt and mounted in a frame and affords a field of approximately 11° nasally, 11° above, 16° below and 25° temporally to the fixation point. It may be used at one-half and one meter distances. Chas. A. Bahn.

Mannis, A. A. **A corneal marker for square transplants.** Tr. Am. Acad. Ophth. pp. 301-302, Jan.-Feb., 1951.

This marker, with both point perforations and full cutting margins, facilitates more accurate and easier placement of the double-bladed knife or other device used in corneal transplants. The cutting or perforating edge penetrates only the superficial layers of the cornea and acts as a guide for the keratome-scissors.

Chas. A. Bahn.

Nugent, M. W. **A hard plastic spectacle lens.** Tr. Am. Acad. Ophth. p. 306, Jan.-Feb., 1951.

The lens is made of allyl diglycol carbonate and is 40 times more scratch-resistant than present plastic spectacle lenses. It weighs approximately one half as much as a similar glass lens. The lens can be made in single vision, in round-topped bifocal form, and in all tints and color. Chas. A. Bahn.

Priestley, B. S. **A mechanical device for the insertion of corneoscleral sutures.** Tr. Am. Acad. Ophth. pp. 293-294, Jan.-Feb., 1951.

Two footplates are pressed together by a spring contained in a shaft. The lower footplate is inserted into the anterior chamber through the incision wound. The upper footplate rests on the outer cornea. The needle is carried by an arm which has the same length as the radius of the needle. A simple system of levers pushes the needle through the tissues.

Chas. A. Bahn.

Seip, W. R. **A novel trephine.** Tr. Am. Acad. Ophth. p. 295, Jan.-Feb., 1951.

The author has simplified the spring type of corneal trephine now in use by

reducing the number of parts to eight and making the instrument easer to use. The blade is contained in a chuck which is connected with a thin-walled barrel. Pressure on this regulates the trephine speed.

Chas. A. Bahn.

Simonson, Ernst. **Lab tests for strenuous visual work disclose significant results.** Tr. Am. Acad. Ophth. pp. 318-322, Jan.-Feb., 1951.

In order to determine eye fatigue under standardized conditions of illumination and color, an experimental instrument was constructed and used. This consisted of very small letters mounted on a long belt which passed at irregular intervals and at irregular levels and was observed through a narrow slit in front of the subject, who had to copy letters without looking down. Starting from a level of 2 ft.-c., performance increased markedly up to 50 ft.-c. but changed very little with higher illuminations. At about 300 ft.-c. there was a slight drop. A decrease of the flicker fusion point is considered a sensitive index of ocular fatigue. There was less fatigue with VR lamps then with FR and NW lamps.

Chas. A. Bahn.

Sysi, R. **Granuloma artificiale in the region of the eye.** Acta ophth. **28**:257-260, 1950.

Two cases of granuloma caused by inclusion of talc in the wound are reported. One was a case of lacrimal phlegmon which was incised and filled with sulfathiazole powder. A granuloma, in which talc was found, developed a month later. The other case was that of a granuloma formed on the eyeball two-and-one-half years after the excision of two small nodules from the eyeball. Inflammatory conditions are conducive to the development of this type of granuloma, and the use of wound powders should therefore be avoided.

Ray K. Daily.

6

OCULAR MOTILITY

King, J. H. **The vertical indicator: for use in the diagnosis of vertical ocular muscle paresis.** Tr. Am. Acad. Ophth. pp. 296-299, Jan.-Feb., 1951.

To facilitate more accurate diagnosis of vertical ocular muscular anomalies, the author has devised a device which graphically presents the muscle involved, when the results of a number of recognized standard tests are used in setting the indicator. A card on which permanent records can be accurately and easily made is also shown.

Chas. A. Bahn.

Lord, M. P. **Measurement of binocular eye movements of subjects in the sitting position.** Brit. J. Ophth. **35**:21-30, Jan., 1951.

It has been suggested that minute independent movements of the two retinas probably control the faculty of depth perception. Accurate measurements of these movements by the use of an elaborate instrument employing the photo-electric corneal reflex and initiated by an ultraviolet beam were made by Lord. His apparatus is described and illustrated in detail. It records the slightest head movements associated with eye movements, and shows that rotations of the eyes occur simultaneously, move in the same direction and are, in general, of the same amplitude.

Morris Kaplan.

Schjelderup, H. **Some considerations concerning traumatic diplopia.** Acta ophth. **28**:377-391, 1950.

This is an analysis of 14 cases of traumatic diplopia treated at the Plastic and Jaw Unit, Basingstroke, England. Five different groups of displacement of the zygomatic bone are distinguished, and special attention is drawn to the orbital tubercle carrying the lateral insertion of

Lockwood's ligament, which is chiefly responsible for keeping the eye at the correct level. The depression of the eye and enophthalmos, encountered in facial fractures, are due to reduction of intraorbital fat by herniation through fissures in the shattered orbital floor into the antrum below, and through the zygomaticosphenoidal suture laterally. Diplopia is attributed to limitation of ocular motility by anchorage of intraorbital fat in cicatricial tissue at the sites of herniation. Treatment should be prompt and should aim at full reduction of displaced bony structures, and prevention of cicatricial anchorages. The use of sliding fascia is suggested to prevent adhesions, and a large opening in the lateral orbital wall to prevent anchorages. Any residual diplopia must be corrected by surgery on the extraocular muscles. (4 figures)

Ray K. Daily.

7

CONJUNCTIVA, CORNEA, SCLERA

Björk, Ake. **On the possibility of testing the surface anesthetic effect of local anesthetics on the human cornea.** Acta ophth. **28**:229-256, 1950.

The study was concerned chiefly with assessing the comparative effectiveness of a new surface anesthetic, xylocain. It was shown that adrenalin or privin instilled into the conjunctiva a few minutes before the instillation of the anesthetic solution intensifies the effect of the surface anesthetic. The author's method, a modification of that of Marx, is described.

Ray K. Daily.

Edmund, Jens. **A case of primary band-shaped opacity of the cornea.** Acta ophth. **28**:209-214, 1950.

A symmetric, bilateral, primary band-shaped opacity of the cornea developed in a woman, 80 years old, who had no other ocular disease. The pathogenesis of the disease is discussed. The condition must be regarded as a senile hyaline degeneration of the elastic tissue of Bowman's membrane, and not an intracellular infiltration of foreign substances.

Ray K. Daily.

Edmund, Jens. **A case of vernal conjunctivitis combined with prurigo Besnier.** Acta ophth. **28**:215-222, 1950.

A rare combination of palpebral vernal conjunctivitis with prurigo Besnier occured in a ten-year-old boy. Both conditions are characterized by intense itching. The etiology of vernal conjunctivitis is reviewed, and the importance of an allergic disposition is stressed.

Ray K. Daily.

D'Ermo, F. **Roentgen therapy for rodent ulcer of the cornea.** Boll. d'ocul. **29**: 718-728, Nov., 1950.

Four cases of this refractory disease responded well to X-ray; the dosage was six applications of 100 r, 178 KW. 2 MA, 30 cm. focal distance, ½cm. zinc and 1 cm. aluminum screen. (78 references)

K. W. Ascher.

Ferrié, Jean. **Subepithelial keratitis in seasonal conjunctivitis.** Arch. d'ophth. **10**:715-717, 1951.

Under the name "seasonal conjunctivitis" Ferrié describes the non-gonococcal conjunctivitis (Koch-Weeks conjunctivitis) which is endemic in Morocco and throughout North Africa but which regularly becomes epidemic in the spring and fall. The disease is by no means benign, and is frequently complicated by corneal ulceration, sometimes with perforation. The author calls attention to the frequent, often unrecognized, diffuse, subepithelial infiltration which develops during the first few days of the disease, and sometimes results in diminished vision. The infiltration disappears without leaving cicatricial changes. The mechanism of

its production has not yet been determined. Phillips Thygeson.

Frandsen, Emil. **Poikiloderma atrophicans vasculare (Jacobi) with conjunctival changes.** Acta ophth. 28:343-354, 1950.

After a brief survey of poikiloderma and its ocular complications, the author reports a case with pemphigoid shrinking and epidermoid transformation of the conjunctiva, epidermal overgrowth, and total occlusion of the lacrimal puncta. There was a doughy edematous swelling of the eyelids, and moderate trichiasis on the right eye, and there were extensive superficial maculae on both corneas. Pemphigus, and benign lymphogranulomatosis, were considered in the differential diagnosis. The author concludes that the conjunctival disease is a part of the skin syndrome, and shows that essential shrinking of the conjunctiva may occur not only in pemphigus but in other diseases as well. Ray K. Daily.

Gallois, A., and Berthod, L. **Precancerous papillomatous dyskeratosis of the cornea.** Ann. d' ocul. 183:1016-1025, Dec., 1950.

A 75-year-old man noted progressive failure of vision coincidental with a growth over the left eye during 25 years. Two triangular opaque corneal elevations with their bases at the limbus, but without vascularity, were observed. The growth was limited to the epithelial layers and the stroma was normal. Sections from the excised growth contained hyperplastic epithelial cells, many larger than normal and some containing two or more nuclei. A second case is quite similar. Both were histologically intraepithelial epitheliomata (Bowen's disease). If excised in the early stages, recurrence is rare. The condition exists in three stages or forms, benign, precancerous, and malignant. The evolution apparently depends on an enzyme whose mode of action is unknown.

Chas. A. Bahn.

Holm, Stig. **Keratoconjunctivitis sicca and the sicca syndrome.** Acta ophth. Supplement 33, pp. 14-230, 1949.

This monograph consists of a comprehensive review of the literature and a report of 88 new cases. The diagnosis was made on the staining pattern of the palpebral and bulbar conjunctiva with Bengal rose, and on reduced lacrimal secretion, as measured by the Schirmer test. The close relation between keratoconjunctivitis sicca and chronic rheumatic polyarthritis is the most striking finding emerging from this investigation. 440 patients with rheumatic polyarthritis and 60 with rheumatic fever were subjected to these tests, and keratoconjunctivitis sicca was definitely present in 13 percent, and probably in an additional 9 percent. About 60 percent were in women. In 12 eyes there was normal lacrimal secretion and marked conjunctival staining. 80 percent of the patients retained the ability to cry, and some had no subjective symptoms. A control group of 500 non-rheumatic patients was subjected to the staining, but not to the Schirmer test; the number found positive was about one fourth of that in the rheumatic group. There were two men in this group and 21 women, who developed the disease at the menopause and in whom a hormonal deficiency was demonstrated by titration tests. The author does not agree with Sjögren, who attributes the hyposecretion of tears to a disturbance in the tear-secreting parenchyma of the lacrimal glands. Biopsies of the parotid glands on three rheumatic and three non-rheumatic patients showed no pathologic changes, and the author assumes that the lacrimal glands are like the parotids in structure. The light sense was examined in 50 patients. Vitamin A deficiency is not a significant factor nor is age. Half of the patients had xerostomia, in one case combined with vulvovaginitis atrophicans, some had Mikulicz's disease and lymphogranuloma

benignum. Unlike Sjögren the author does not accept keratoconjunctivitis sicca as a distinct clinical entity. He believes it to be a local disease with manifold etiologies, or part of a systemic disturbance. The prognosis is regarded as favorable; there was visual impairment in 20 percent. Therapy is symptomatic. Diathermic closure of the lacrimal canaliculi is advocated; 20 of 21 patients thus treated had favorable results. (11 figures, 17 tables, 1 graph, extensive bibliography) Ray K. Daily.

Kall, Erik. **A conjunctivitis of possible protozoal origin occurring in Denmark.** Acta ophth. **28**:409-420, 1950.

The conjunctivitis described set in with a chill and a sensation of foreign body in the eye; in a few days a serous secretion appeared and soon became purulent and abundant, with severe conjunctival injection, and a diffuse succulent more or less follicular swelling, most marked in the inferior fornix. Laboratory studies of conjunctival scrapings revealed a protozoa-like organism, the exact nature of which has not been ascertained. (12 figures)

Ray K. Daily.

Knape, Birgitta. **On skin tests with testosterone and desensitization treatment in cases of keratitis ex acne rosaceae, acne rosaceae faciei and various forms of keratoconjunctivitis.** Acta ophth. **28**:339-342, 1950.

The author was not able to verify the studies of Zondeck and Bromberg on skin sensitivity to testosterone in keratitis with acne rosacea, and with acne rosacea associated with blepharoconjunctivitis, although the same preparation was used. In spite of the negative skin tests, treatment with testosterone proved effective in five of eight cases. An endocrinologic disorder may therefore be a factor in acne rosacea and its ocular complications.

Ray K. Daily.

Larsson, S., and Osterlind, G. **The pathogenesis and treatment of hypopyon ulcer.** Acta ophth. **28**:307-320, 1950.

The bacteriologic study of 115 hypopyon ulcers showed that decreased corneal resistance to infection was an important contributory cause and exercised a strong influence on the course of the disease. The diminished corneal resistance may be a part of a generally poor physical condition. The material was divided into three groups: ulcers treated by optochin derivatives, sulfa preparations, and antibiotics. Antibiotics gave better final visual acuity than the other two agents.

Ray K. Daily.

Oksala, Arvo. **A case of conjunctivitis membranacea.** Acta ophth. **28**:179-185, 1950.

A child, two and one-half years old, had membranous conjunctivitis of one year's duration which involved the lids of both eyes. The conjunctiva was covered with dense, thick, yellowish white membranes which spread from the lid margin to the fornix, and were thicker at the margins. They stuck fast to their base, and left a bleeding surface on being removed. Laboratory studies showed no diphtheria bacilli; pneumococcus, haemophilus and non-pathogenic organisms were isolated at various times. The disease resisted all treatment, and final recovery was spontaneous and without sequelae.

Ray K. Daily.

Shah, M. A. **Aureomycin in trachoma.** Brit. J. Ophth. **35**:50-52, Jan., 1951.

Seventy-five patients were observed for the effect of the drug on the pannus, which was present in all of them. It was used by instillation every two hours and continued for 7 days to 55 days. In all but 2 there was dramatic improvement and the eye became white within 5 to 7 days. Regression of the pannus occurred in only 6; in 69 there was no effect on the

pannus but all other symptoms promptly cleared. Morris Kaplan.

Stankovic, M. **The surgical cure of recurrent pterygium with autoplastic conjunctiva graft.** Ann. d'ocul. **184**:41-47, Jan., 1951.

After dissecting the pterygium from the cornea, the author replaces the denuded conjunctiva with a graft from the upper temporal ocular conjunctiva. The area from which the graft is taken is covered by two tongue-shaped conjunctival flaps, the upper pointing nasally, the lower temporally. Approximately 12 sutures are used to cover the conjunctiva from which the graft is taken and 8 to 10 to fix the graft at the site of the previous pterygium. (8 figures) Chas. A. Bahn.

Werner, Sigurd. **A peculiar case of subconjunctival implantation cyst on the globe.** Acta ophth. **28**:203-208, 1950.

A large sausage-like subconjunctival implantation cyst developed in the area around the limbus from 6 to 3 o'clock, in an eye which had had a perforating injury at the limus four years previously. The wound had been closed by a conjunctival flap after excision of the prolapsed iris. When about one-third of the cyst was extirpated, the rest collapsed and did not reform after two and a half years. (2 figures) Ray K. Daily.

Zeppa, Rosario. **The curvature of the cornea in peripheral leukomas.** Ann. di ottal. e clin ocul. **76**:401-411, Nov., 1950.

From measurements made with Helmholtz's ophthalmometer Zeppa found that a peripheral leukoma usually causes a meridional flattening of the cornea in the sector occupied by the leukoma. The degree of flattening increases toward the periphery. This flattening and other irregularities in the surface of the cornea are accentuated in proportion to the extent and depth of the leukoma and to its nearness to the central zone.
Harry K. Messenger.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

D'Ermo, F. **The reaction to antigen of sensitized isolated rabbit iris sphincters.** Boll. d'ocul. **29**:681-684, Nov., 1950.

Five days after intravenous injection of 0.5 cc. of fresh egg albumin, rabbits were given 2 cc. of the same substance intraperitoneally for five days; then for eight more days 1 cc. was given intraperitoneally. On the 26th day, 4 cc. of egg albumin was injected subcutaneously. Between the thirty-third and thirty-sixth day, 2.5 to 4 cc. were given intravenously. Sensitization was obtained in 80 percent of the animals. The strips of sphincter, isolated by the author's method, were kept in 7 to 8 cc. of Tyrode solution at 27°C. While histamin administration even in 1/500,000 and 1/1,000,000 dilution was followed by contraction of the strips of sphincter, egg albumin (0.1, 0.3, 0.5, 1.0, 2.0 cc.) did not bring about contraction. The sensitization of the animals was proved by the presence in the blood serum of precipitins, and by death after intravenous injection of 2.5 cc. of the antigen. The author concludes that the iris sphincter does not have any means to fix antibodies. (References)
K. W. Ascher.

Lowe, R. F. **Choroideremia. A report of three cases in three generations.** Brit. J. Ophth. **35**:31-37, Jan., 1951.

Choroideremia is often confused with retinitis pigmentosa but is a different clinical entity entirely. The disease is hereditary, differs in men and in women and is transmitted by the female. In the male it is progressive, with night-blindness in childhood, followed by progressive loss of sight and advancing field defects, and

blindness in old age. There is progressive retinal degeneration and choroidal atrophy. The vessels and the discs remain fairly normal. The fundus is a brilliant white with tiny islands of retina scattered throughout.

In women the disease is relatively benign. Progression is very slow, with small scattered patches of degeneration of retina and choroid. Vision and visual fields are little affected. Any person with normal fundus can be assured that none of the children will have choroideremia. An affected male will have normal sons, but his daughters will have the disease, with, however, little detriment to vision. An affected female will transmit the disease to half her sons, who will eventually become blind, and to half her daughters, who will have normal vision but who will pass the disease on to their descendents in the same proportions. Three cases in three generations are described.

Morris Kaplan.

Osterlind, Göte. **Considerations on the treatment of sympathetic ophthalmitis in the initial stage.** Acta ophth. **28**:133-137, 1950.

Six cases of sympathetic ophthalmia are briefly reported. Osterlind concludes that enucleation of the exciting eye, even if it still has vision, is indicated, if daily examination with the slitlamp and corneal microscope has permitted a definite diagnosis in the initial stage. (1 table)

Ray K. Daily.

Osterlind, Göte. **Experimental studies into the pathogenesis of allergic inflammation in the uveal tract.** Acta ophth. **28**: 139-162, 1950.

Subconjunctival injection of horse serum failed to penetrate into the aqueous, as tested by precipitinogen tests, but the same injection plus mechanical trauma or a simultaneous injection of 0.2 cc. of 10-percent saline solution impaired the intraocular barriers sufficiently to permit penetration. In a series of experiments on rabbits the eyes were sensitized by subconjunctival injection of 0.5 cc. of horse serum, and 0.2 cc. of 10-percent saline. After an interval of 19 to 32 days the animals were given intravenous injections of horse serum. Most of the eyes developed a uveitis of varying intensity, which often also affected the fellow eye. In further experiments it was demonstrated that a hypersensitization of the uvea could be produced by the subconjunctival injection of horse serum associated with trauma. An iridocyclitis was produced in some of these eyes by a subsequent intravenous injection of horse serum. In an eye participating in a systemic sensitivity produced by a previous intravenous injection of horse serum, iritis was brought on by subsequent intravenous injections plus trauma. These experiments indicate that probably the different types of allergic uveitis in man are essentially the same as those produced experimentally.

Ray K. Daily.

Schreck, E. **The etiology of sympathetic ophthalmia.** Berichte der deutschen ophth. Ges. **56**:103-111, 1950.

Two years ago the author described in histologic sections of sympathetic periangiitis the occurrence of bodies, 0.4 to 0.8 μ in diameter, which, he thought, might be related to the cause of sympathetic ophthalmia. In the paper under review Schreck reports the production of a sympathetic ophthalmia-like granulomatous uveitis in both eyes of chickens of which one eye had been inoculated intravitreally with aqueous or ground-up uvea from human sympathetic ophthalmia. This uveitis was readily transferable to other chickens, again by intravitreal inoculation of aqueous or ground-up uvea from infected chickens. On the chorioallantoic membrane of fertilized chicken eggs the original human material as well

as the infected chicken uvea gave rise to massive growth of the kind of bodies mentioned in the beginning. The author considers these bodies as the cause of sympathetic ophthalmia. Its nature, rickettsia or protozoan, is uncertain. The inoculation of chorioallantoic membranes of fertilized chicken eggs with the aqueous of injured human eyes may aid in the recognition of those eyes that endanger their mates. Peter C. Kronfield.

9

GLAUCOMA AND OCULAR TENSION

Von Beuningen, E. G. A. **The optical density of the corneoscleral trabeculum in primary glaucoma.** Berichte der deutschen ophth. Ges. **56**:132, 1950.

By combining colloidometry (Am. J. of Ophth. **24**:51, 1941) with narrow-beam slitlamp microscopy of the chamber angle, the author estimated the optical density (turbidity) of the corneoscleral trabeculum in 273 eyes with primary glaucoma and in 250 control eyes. In both groups the turbidity of the trabeculum increased with age. A statistically significant difference in optical density existed between the two groups, the glaucomatous eyes being characterized by a greater density. The latter, in the glaucomatous eyes only, could be shown to be greater in the eyes with higher ocular tension. The increase in optical density in eyes affected with primary glaucoma plays a decisive part in the physiologic pathology of the ocular tension. The increased density is probably a sign of sclerosis which, presumably, is secondary to sclerosis of the surrounding vessels. Peter C. Kronfeld.

Cristini, G. **Common pathological basis of the nervous ocular symptoms in chronic glaucoma.** Brit. J. Ophth. **35**:11-20, Jan., 1951.

This study consisted of the histologic comparison of advanced glaucomatous nerve tissue with ordinary senile optic nerve tissue. By ordinary staining procedures there was little difference, but when a benzidine stain was used the difference became clear. The number of small vessels was conspicuously reduced; the meshes of the capillary network were fragmented and the individual capillary lumina obliterated. This caused ischaemia of the nervous tissue. The changes were found within the nerve outside the eyeball as well which shows they were not caused by the rise in the intraocular pressure. These histologic changes are independent of the pressure changes and most probably account for the cavernous atrophy as well as the laminary changes, the glaucoma halo and the field defects. (10 figures) Morris Kaplan.

Hallerman, W. **Cyclodiathermy in secondary glaucoma.** Berichte der deutschen ophth. Ges. **56**:151-154, 1950.

Surface coagulation of the sclera over the pars plana following the technique of Weekers (Am. J. Ophth. **29**:1183, 1946) was used with the following results. The tension became normal in 16 of 20 eyes in which the glaucoma was secondary to chronic iridocyclitis; in 5 of 5 in which it was secondary to injury; in 2 of 4 secondary to obstruction of the central retinal vein; and in 3 with hydrophthalmos.

The operation was well tolerated, even in eyes with very active iridocyclitis.

Peter C. Kronfeld.

Vom Hofe, K. **Further observations concerning congestive glaucoma.** Berichte der deutschen ophth. Ges. **56**:133-134, 1950.

Vom Hofe cites a number of instances of acute congestive attacks following acute extraocular diseases of various kinds and stresses the primarily congestive nature of the acute attack. In some attacks he has seen the shallowness of the chamber develop. The dark room test and

the mydriatic test often give divergent results in the same patient.

Peter C. Kronfeld.

Huggert, Arne. **The use of privine as a pressure-reducing medium in iridocyclitis glaucomatosa.** Acta ophth. **28**:393-407, 1950.

In 12 cases of iridocyclitis with increased intraocular pressure the tension was adequately reduced by the instillation of privine. An examination of the conjunctiva, episcleral vessels and aqueous veins demonstrated that privine, like glaucosan, produces a contraction of the bloodvessels with simultaneous widening of the aqueous laminae and the manifestation of new and previously invisible ones.

Ray K. Daily.

Loehlein, H. **Pharmacological effects upon the episcleral venous pressure and the outflow pressure in normal and glaucomatous eyes.** Berichte der deutschen ophth. Ges. **56**:146-151, 1950.

The episcleral venous pressure (VP) was measured by placing a tiny transparent pressure chamber connected with a manometer over a small episcleral vein and raising the pressure until the vein collapsed. The difference between the ocular tension (OT) and the VP was taken to represent the outflow pressure (OP). A very regular linear relationship between ocular tension and VP was found in nonglaucomatous eyes. On 100 control eyes and 51 eyes with chronic simple glaucoma the following averages were obtained:

	Controls	Glaucomas
OT	13.7	21.5
VP	9.6	8.3
OP	4.1	13.2

In the chronic glaucomas OT and OP were higher, but VP lower than in the controls. The high OP could be due to increased flow or increased resistance to flow. The data thus far available point toward increased outflow resistance, but are not conclusive.

Under the effect of pilocarpine (2%, single application) OT drops slightly but VP rises. In glaucomatous eyes OT drops more markedly despite the same or even greater rise of VP. The drop in OT associated with a rise of VP permits the interpretation that pilocarpine causes widening of the drainage channels, more markedly in the glaucomatous than in the control eyes. In the chronic glaucomas whose OT was refractory to pilocarpine, VP failed to show the typical response to the drug.

Peter C. Kronfeld.

Niedermeier, S. **Experimental studies of the mechanism regulating the ocular tension.** Berichte der deutschen ophth. Ges. **56**:134-136, 1950.

Niedermeier reports enhancement of the miotic and tension-lowering effect of mecholyl or pilocarpine in glaucomatous eyes by the additional local administration of 10-percent thiamine hydrochloride. Other examples of augmentation of pharmacological effects on autonomically innervated structures by simultaneous administration of thiamine hydrochloride are quoted. Primary glaucoma is a manifestation of dysfunction of the vegetative nervous system causing loss of tone of the choroidal vessels.

Peter C. Kronfeld.

Obal, A. **Hormonal regulation of the ocular tension.** Berichte der deutsche ophth. Ges. **56**:136-146, 1950.

The author discusses the relationship between sex hormones and hyaluronic acid-hyaluronidase equilibria in various parts of the body, and reports beneficial results obtained with progesterone (by mouth and intramuscularly) in seven cases of acute glaucoma. The tension-lowering effect is thought to be due to a decrease in the volume of the vitreous

which, in turn, is due to a shift of the local hyaluronic acid-hyaluronidase equilibrium. Peter C. Kronfeld.

Reiser, K. A. **Operative results obtained with diathermy punctures of the sclera.** Berichte der deutschen ophth. Ges. **56**: 155-158, 1950.

This modification of the cyclodiathermy operation consists of six to eight applications of a coagulating high frequency current to the surgically exposed sclera about 8 mm. from the limbus. The duration of each application is 8-10 seconds, the intensity of the current 70 milliamperes. The diameter of the rod-shaped electrode is about 1.5 mm. The procedure is a surface coagulation rather than a diathermy puncture. Tension was made normal in a very high percentage of primary and secondary glaucomas. The operation is easy to perform and to repeat and there is only very small trauma.

Peter C. Kronfeld.

10

CRYSTALLINE LENS

Brand, I. **Contribution to data on the pathogenesis of tetany cataract.** Acta ophth. **28**:371-376, 1950.

In a case of tetany with cataract the calcium concentration of the aqueous was found to be 8.8 mg. percent. The serum calcium was 2.3 mg. percent. The author concludes that hypocalcemia is not a factor in the genesis of this cataract, and that the increased permeability of the lens capsule alone accounts for the passage of considerable amounts of calcium into the lens and thereby promotes the development of cataract. The change in the permeability of the lens capsule is attributed to some hormonal factor. Ray K. Daily.

Brolin, Sven Elov. **Spectrophotometric investigations on the fluorescence of the lens of the eye in rats given naphthalin.** Acta ophth. **28**:163-177, 1950.

This is one in a series of investigations on fluorescence of the lens in experimental cataracts, to determine whether fluorescence can be used as a general indicator of precataractous changes, and whether it can be used as a criterion for differentiating, at an early stage, different metabolic disturbances in the lens leading to cataract. The data show that a powerful increase in fluorescence in the cortex and in the nucleus ensues in rats fed on naphthalin for 8 to 16 days. The increase of fluorescence does not depend on the appearance of lens opacities; it is one of the earliest lens changes after administration of naphthalin. In rats, as in man, the fluorescence increases with age. (1 figure, 3 tables) Ray K. Daily.

Magni, S. **Development of cataract due to posterior synechias after antiglaucomatous sclero-iridectomy.** Boll. o'ocul. **29**: 685:690, Nov., 1950.

Investigating the iris tissue obtained during antiglaucomatous operations, Magni found minute particles of lens capsule adherent to the removed iris, also sometimes epithelial cells originating in the anterior lens epithelium. The rapid opacification of the lens after surgery for glaucoma may be due to injury of its protective capsule, not to the reduction of intraocular pressure. Prolonged use of miotics may produce posterior synechias; therefore, the intervention should not be delayed too long. (3 figures)

K. W. Ascher.

Paul, Hans. **Bird-like facies with permeability cataract as a result of trophic disturbances.** Klin. Monatsbl. f. Augenh. **117**:529-532, Jan., 1950.

The two patients showed underdevelopment of the mandibles, chins, and lower teeth. The cataracts progressed so that operation was eventually necessary. One patient had a microcornea, the other a megalocornea and both showed pigment

atrophy of the iris. Inflammatory or mechanical changes in the lenses were absent. Theodore M. Shapira.

Sedan, Jean. **Postoperative hemorrhage following cataract extraction.** Ann. d'ocul. **184**:1-16, Jan., 1951.

Ocular hemorrhages were observed 330 times in 1,832 cataract operations. Some lasted only a day or two, others were so severe that enucleation became necessary. Hemorrhage occurred also in the anterior and posterior uvea and the retina. Age was relatively unimportant. In the sixty year group hemorrhages were slightly more frequent than the 80 year group. Diabetes predisposed to hemorrhage especially when the test, which is based on the number and size of precapillary hemorrhage following the application of a tourniquet about the arm, was positive. In moderate uncontrolled and uncomplicated ocular and arterial hypertension the incidents of hemorrhages was not materially increased. In severe or complicated glaucoma and arterial hypertension the incident of intraocular hemorrhage was greatly increased. Myopia was unimportant but adrenalin, especially in large doses, was one of the major causes of severe hemorrhages after cataract extraction. In the ab externo incision the incident of intraocular hemorrhage was materially less than with other techniques.

Chas. A. Bahn.

Thorpe, H. E. **A new cataract suture.** Tr. Am. Acad. Ophth. pp. 289-291, Jan.-Feb., 1951.

In this modification of the McLean suture, a semicircular troughlike nonperforating incision is made concentric with and 1 mm. behind the limbus. Two double armed atraumatic sutures are passed from behind forward through the posterior and then anterior lip of the incision in the 11 and 1-o'clock positions. A keratome perforating incision is made in the trough and the cataract is extracted. The sutures are then tied. Chas. A. Bahn.

Voss, H. J. **A specific indication for Mintakol.** Berichte der deutschen ophth. Ges. **56**:173-175, 1950.

Mintakol is a cholinergic stimulant of the anticholinesterase type which the author has found specifically suitable to produce miosis after intracapsular cataract extraction. In rabbits Mintakol causes a primary phase of increased permeability followed by a secondary phase of decreased permeability of the blood-aqueous barrier. This sequence of effects (observed in the rabbit) seems desirable for the prompt healing of a cataract wound. Because of H. Scheie's objection to the use of miotics of the anticholinesterase type after ganglionic block by the retrobulbar injection of procaine Voss investigated the miotic effect of the Mintakol after retrobulbar administration of procaine in rabbits and man. The ganglionic block was found to delay the miotic effect by about 30 minutes but not to prevent it. Mintakol, therefore, is the miotic of choice after intracapsular cataract extractions. Peter C. Kronfeld.

11

RETINA AND VITREOUS

Berkson, J. **Retinal arteriolar spasm in toxemia of pregnancy.** Tr. Ophth. Soc. U. Kingdom **69**:157-169, 1949.

Of 200 pregnant women 97 had normal fundi, 32 had narrowed retinal arteries, 44 had contractions of the retinal arterioles, 7 had spastic contractions which later showed hemorrhages and 20 had hemorrhages, exudates, edema or retinal detachments. There were 2 with retinal detachment and 10 cases of hypertensive neuroretinopathy.

The range in blood pressure was from 120/70 to 170/120. The retinal arteries were narrowed to one half or even one

third of the width of the vein. Spastic contractions occurred as two types: 1. fine fleeting contractions in the narrowed retinal arterioles and 2. sausage-shaped constrictions near the optic disc. None of the signs has value in the prognosis of eclamptic attacks. Beulah Cushman.

Braendstrup, Poul. **Central retinal vein thrombosis and hemorrhagic glaucoma.** Acta ophth. Supplement 35, pp. 1-162, 1950.

This is an analysis of 131 cases gathered from the records of two large Danish eye departments. They represent severe, complicated forms of the disease and 65 of the 131 developed hemorrhagic glaucoma. Males predominated, and the left eye was more often involved. The incidence generally increases with age and the onset is sudden. Trauma is an inciting cause, and excitement and strain with abdominal pressure are contributing factors in patients with vascular disease. The patient delays consulting a physician because of the absence of pain and visible inflammation. About one third of the patients were examined within two weeks after the onset of symptoms and more than half within a month. Visual acuity varies widely and is not proportionate to the physical changes. The general condition of patients with central vein thrombosis was studied and many had high blood pressure and arteriosclerosis. Eleven patients had a cerebral vascular accident before or after thrombosis of the retinal vein. A relation between a general infection and retinal thrombosis was not demonstrable. The central vein thrombosis in most cases is a local manifestation of the vascular affections common to age. The course of the disease, the progress and final result in the visual acuity are analyzed in great detail. A better visual acuity was attained by the younger, healthy patients and by those who had a better primary vision. Central vein thrombosis has distinct tendencies to spontaneous resorption, and the severe damage to visual acuity is due to the degeneration of the sensitive central retinal region, which is but little affected by therapy. An exhaustive study was made on the relation of retinal thrombosis to hemorrhagic glaucoma. Glaucoma complicates 66 percent of the cases, and usually begins within 3 to 6 months after the occurrence of the thrombosis. There are no danger signals and it is questionable if any medication has a prophylactic effect. The onset of glaucoma is acute, and a few days after the rise of ocular tension the newly formed vessels in the iris, which are diagnostic of this condition, appear. Forty eyes in this series had to be enucleated.

Of importance for the early diagnosis are the characteristic newly-formed peripupillary iris vessels, which appear after or simultaneously with the increase in tension. In eyes with hemorrhagic glaucoma, which are not enucleated, shrinking of the iris ensues under formation of anterior peripheral annular synechia and ectropion of the uvea, the newly formed vessels become large, and cataract develops. The histologic findings are an obliteration of the anterior chamber and formation of a shrinking vascular membrane on the anterior surface of the iris. There is as yet no explanation for the vascular changes in the uvea caused by an affection of the retinal circulatory system, and the pathogenesis of these changes is obscure. (6 figures, references)

Ray K. Daily.

Cucco, Giovanni. **Angioid streaks in the pathology of choroid and retina and in the larger picture of systemic elastorrhexis.** Ann. di ottal. e clin. ocul. **76**:297-319, Sept., 1950.

Cucco presents detailed reports of two patients with angioid streaks and pseudoxanthoma elasticum. From his study of

these and of other cases of angioid streaks reported in the literature he concludes that the prevailing theories regarding the interpretation of these streaks must be revised. Although the frequent association of angioid streaks and pseudoxanthoma elasticum is indubitable, yet it is wrong to regard the streaks as only a feature of a generalized or systemic dyselastic syndrome (systemic elastorrhexis, with specific cutaneous, ocular, and cardiovascular manifestations). In angioid streaks two characteristic lesions are found in Bruch's membrane: linear ruptures, and calcification. These alterations can be regarded in a sense as primary, and thus understood the streaks cease to be merely a manifestation of a systemic disease and become a definite pathologic entity in themselves. The integrity of Bruch's membrane, as is well known, may suffer in various conditions, such as pseudoxanthoma elasticum, Paget's disease, and other degenerative and metabolic disturbances. The fundus changes usually associated with angioid streaks can best be understood in the light of the patient's constitutional characteristics, such as his dynamic structural type. (4 figures, 12 references) Harry K. Messenger.

Fanta, H. **Cyclodialysis with incarceration of vitreous.** Berichte der deutschen ophth. Ges. **56**:158-165, 1950.

The gonioscopic finding of unintentional displacement of vitreous into functioning cyclodialysis in pockets suggested the idea that the vitreous plays an important part in keeping the pocket open. In 12 cases of glaucoma following cataract extraction cyclodialyses were performed through trephine openings in the sclera (after von Sallmann). At the end of the sweep, which was made from behind forward, the spatula was tipped slightly so as to engage and break the anterior face of the vitreous. The ocular tension became normal in 11 of the 12 cases, and in the majority vitreous could be identified in the pocket. A survey of cyclodialyses done with the conventional technique revealed three cases in which the gonioscopic examination suggested a wedge action of unintentionally displaced vitreous.

One disadvantage of the intentional vitreous incarceration is that bleeding from the area of the cyclodialysis leads to more extensive and more lasting clouding of the vitreous than after the conventional operation. Other disadvantages are localized corneal edema due to apposition of vitreous, and the greater danger of retinal detachment. Peter C. Kronfeld.

Franceschetti, A. **Mycosis fungoides with ocular manifestations (a case with dysoric retinopathy).** Ann. di ottal. e clin. ocul. **76**:413-420, Dec., 1950.

Franceschetti reports a case of mycosis fungoides in which the fundus of one eye showed three small "cotton wool" patches overlying the retinal vessels. These patches subsequently disappeared. In Franceschetti's opinion they should be interpreted as a sign of dysoria, that is, a disturbance in the blood-tissue barrier attributable in this instance to some toxic factor. (4 figures, 25 references)
Harry K. Messenger.

Heath, P., and Ginsberg, J. **Bilateral cystic massive separation of the retina in a juvenile.** Tr. Am. Acad. Ophth. p. 280, Jan.-Feb., 1951.

The patient, a 16-year-old boy with hyperplastic osteochondrodystrophy since infancy, had the left eye enucleated two years previously because of potential neoplasm associated with extensive retinal separation with partial disinsertion. One year later the right eye underwent a similar massive retinal separation and partial disinsertion. After a Safar retinopexy the retina was partially replaced. Vision was reduced to light perception and the eye

was hypotonic. The authors think that the ocular condition resulted from altered vascular permeability and that the osteochondrodystrophy and the retinal separation were unrelated. Chas. A. Bahn.

Kyle, J. L. **Ocular findings in congenital heart disease.** Canad. M.A.J. **62**:263-266, March, 1950.

Thirty children with congenital heart disease were examined for ocular manifestations. A typical fundus picture termed cyanosis retinae was described. The veins were engorged and tortuous. The arteries resembled normal veins. The entire fundus had a purplish hue. The most marked degree of the cyanosis was observed in cases of the tetralogy of Fallot and Eisenmenger's syndrome, and appeared to be directly related to the degree of polycythemia. (1 table, references)

Bennett W. Muir.

Larsson, S., and Nord, B. **Some remarks on retinal vein thrombosis and its treatment with anticoagulants.** Acta ophth. **28**: 187-20, 1950.

Fifty-nine cases of a central vein thrombosis and 41 cases of thrombosis of a tributary vein were treated with heparin and dicumarol. There was improvement in 42 percent of central vein involvement, and 58 percent of the tributary vein. The group of patients with central vein thrombosis who had a final vision of 0.9 to 1.0 consisted of younger patients, in good health, without retinal vascular changes, and without general arterial hypertension. Perhaps the cause is angiospasm; the results of treatment with anticoagulants are not at all decisive. (7 tables, references)

Ray K. Daily.

Melodia, Corrado. **Jensen's retinochoroiditis.** Ann. di ottal. e clin. ocul. **76**: 373-400, Nov., 1950.

After reviewing the literature Melodia reports and discusses six cases of Jensen's retinochoroiditis that came under his observation. He concludes that this particular form of retinochoroiditis is a definite and separate nosological entity, characterized not only by the site of the lesion near or at the disc but also by the absolute sector-like scotoma extending to the extreme periphery and corresponding to the distribution of the nerve fibers in the retina. The scotoma is held to be due to direct injury of the nerve fibers, and the initial site of the lesion is presumed to be in the retina rather than in the choroid. The etiology is varied, but tuberculosis and syphilis are important factors. (6 figures, 50 references)

Harry K. Messenger.

Sjögren, Henrik. **Dystrophia reticularis laminae pigmentosae retinae.** Acta ophth. **28**:279-295, 1950.

This is a hereditary disease, limited to the pigment layer of the retina, characterized in its earliest stage by a peculiar netlike structure of the pigment in the pigment layer of the retina, and later by the gradual disintegration and disappearance of the retinal pigment. The sensory epithelium of the retina is not involved and there are no functional disturbances. The choriocapillaris remains normal. Eight cases occurred in a family of 13 children, whose parents were cousins.

There is a group of hereditary diseases primary in the pigment layer of the retina, in which the sensory epithelium is either normal or affected only secondarily, for which the author suggests the name dystrophia laminae pigmentosae retinae. It includes dystrophia reticularis, which the author reports, dystrophi centralis, Doyne's honeycomb or colloid degeneration and fundus albipunctatus. (6 fundus drawings, genealogic table)

Ray K. Daily.

Corsby, A., Klein, M., Gann, J. H., and Siggins, G. **Unusual retinal detachment,**

possibly sex-linked. Brit. J. Ophth. **35**: 1-10, Jan., 1951.

Three generations of a family with a similar type of retinal detachment were studied in detail. Eight men had the disease; none of their progeny had detachments while the male progeny of the unaffected females did, which means that it was most probably a sex-linked recessive trait. The younger of the affected members showed a type of cystic detachment, while the older patients had extensive degenerative, pigmentary retinal changes, which proved that the disease had been progressive. The ages ranged from 13 to 60 years and in most cases both eyes were affected. The four younger patients had the cystic or falciform type of detachment with multiple peripheral disinsertions and it could be predicted that these would terminate in the extensive deterioration of retinal tissue which the older cases exhibited. (13 figures) Morris Kaplan.

Sysi, R. **The effect of the suction cup sucked to the surface of the eye on intraocular pressure and the serviceableness of the suction cup as an ophthalmodynamometer.** Acta ophth. **28**:261-269, 1950.

A suction cup for determining the pressure in the retinal vessels is subject to many sources of error, none of which can be completely eliminated. Therefore the retinal pressure cannot be measured with sufficient accuracy by using the suction cup as an ophthalmodynamometer.

Ray K. Daily.

12

OPTIC NERVE AND CHIASM

Bessiere, E., and Julien, R. G. **Lesions of the optic disc in the syndrome of temporal arteritis. Frequency of ischemic edema of the papilla.** Arch. d'opht. **10**:701-714, 1951.

The syndrome of temporal arteritis, sharply defined clinically and pathologically, is characterized by the great frequency and gravity of the ocular complications. Several types of ocular lesions are reported but the most important, seen in four cases described in detail by the authors, is the ischemic optic neuritis first defined by Wagener and best known under the name of ischemic edema of the papilla. This lesion is first manifested by a sudden loss in vision associated with a white, edematous disc which later evolves to optic atrophy. No visual improvement has been known to occur. The authors suggest that the lesion is primarily in the ophthalmic artery within the nerve but at some distance from the disc and conclude that the edema is due to the retinal arterial hypotension.

The etiology of the syndrome is unknown but the authors group it with the other types of thrombosing periarteritis such as periarteritis nodosa, thromboangiitis obliterans of Buerger, and rheumatismal arteritis, all of which are included in the group of adaptation diseases described by Hans Selye. Treatment of the ocular lesions has been unsuccessful. Amelioration of the pain and inflammatory signs has been obtained by resecting the affected temporal artery. (64 references) Phillips Thygeson.

Klar, J. **The pathogenesis of the excavation of the nerve head in methyl alcohol poisoning.** Berichte der deutschen ophth. Ges. **56**:178-181, 1950.

In 18 of 19 cases of acute methyl alcohol poisoning, the author found the cerebrospinal pressure (measured suboccipitally with the patient lying on his side) abnormally low. This hypotension within the retrolaminar tissues may be a factor in the pathogenesis of the marked excavation characteristic of the optic atrophy caused by methyl alcohol intoxication.

Peter C. Kronfeld.

Marsico, V. **Opticochiasmatic arach-**

noiditis of definitely traumatic origin. Boll. d'ocul. **29**:729-735, Nov., 1950.

A man, 38 years old, after an injury of the forehead lost consciousness, but next day was able to work. Four days later headaches and visual disturbances appeared and papilledema which soon disappeared. After eight months of relative well-being, there were severe headaches, postneuritic optic nerve atrophy, visual field constriction and diminished vision. Operation was refused. Thirteen months after the injury, vision was 0.1 and 0.2, and the field was constricted. Laboratory tests revealed no pathologic changes.

K. W. Ascher.

Mitchell, R. M. **Glioma of the optic nerve: report of a case cured by operation.** New Zealand M. J. **49**:686-688. Dec., 1950.

An astrocytoma of the right optic nerve was removed by the transfrontal approach in a three-year-old child with good results.

Irwin E. Gaynon.

Theobald, G. D., and Middleton, W. H. **Congenital cyst of the optic nerve with encephalocele.** Tr. Am. Acad. Ophth. pp. 277-279, Jan.-Feb., 1951.

Enucleation of the left eye of an infant, aged 11 months, was performed because of increasing exophthalmus since birth. A congenital cyst was interposed between the optic nerve and its arachnoid sheath on the nasal side and extended into the posterior part of the globe through a defect in the sclera. Chas. A. Bahn.

13

NEURO-OPHTHALMOLOGY

Cazzullo, C., and Oxilia, E. **Clinical and physiological observations on three cases of ptosis "à bascule."** Ann. di ottal. e clin. ocul. **76**:421-444, Dec., 1950.

The authors report three cases, presumably of congenital origin, of that variety of unilateral ptosis in which the patient can voluntarily open the affected eye when (and only when) the sound eye is covered. Their studies led to the conclusion that the site of the lesion is most likely in the nucleus of the oculomotor nerve and in the nucleoradicular pathways, and that the etiology is most likely to be sought in some inflammatory process. Electro-encephalograms showed diffuse anomalies not easy to interpret. (20 figures, 50 references.)

Harry K. Messenger.

Chorobski, Jerzy. **The syndrome of crocodile tears.** Arch. Neurol. and Psychiat. **65**:299-318, March, 1951.

In a 36-year-old woman a facial paralysis of slow development was complicated by the syndrome of crocodile tears. Although the motor paresis did not fully disappear, the tearing, which occurred several months after the onset of the disease, finally disappeared spontaneously. A rather detailed review of the literature and anatomy is given. Almost all patients having this syndrome did not weep spontaneously upon emotional stimulation. The phenomenon may follow paralysis of the facial nerve of any cause. It can appear right after the onset of a disease or, more often, either as the only sequel of a disease or associated with such disturbances as "tic," increased tone of the facial musculature, or angeusia. Duration may be short, but usually is months or years. It is produced by the sensation of taste and practically never any other agents. (3 figures) Bennett W. Muir.

NEWS ITEMS

Edited by DONALD J. LYLE, M.D.
601 Union Trust Building, Cincinnati 2

News items should reach the editor by the 12th of the month but, to receive adequate publicity, notices of postgraduate courses, meetings, and so forth should be received at least three months before the date of occurrence.

DEATHS

Dr. William Carey Cheek, Springfield, Missouri, died January 4, 1951, aged 57 years.

Dr. Herbert Moulton, Fort Smith, Arkansas, died January 23, 1951, aged 90 years.

Dr. Carl Bauer, a Swiss ophthalmologist who resided in Mexico City for more than 40 years, died of a cerebral hemorrhage in that city, in January, 1951. He was a student in the clinic under Professor Haab in Zurich, and was encouraged by him to go to Mexico to start his career there. A member for many years of the Mexican Ophthalmological Society, he kept pace with the developments in ophthalmology by means of frequent trips to Europe and working with celebrated clinicians like Gonin, Elschnig, and Ernst Fuchs. He was assistant at Moorfield's Hospital in London for some time.

Dr. Bauer had an extensive practice and was a well-known ophthalmic surgeon in Mexico for many years. He was most esteemed socially for his humanitarian qualities, his contributions to charity, and his desire to help his patients, especially those in dire financial circumstances.

He wrote few articles for the ophthalmic journals, but his great desire was to excel in private practice.

MISCELLANEOUS

TILDERQUIST MEMORIAL LIBRARY

A unique honor was paid to an ophthalmologist, Dr. David L. Tilderquist of Duluth, Minnesota, when the St. Louis County Medical Society, consisting of some 234 members, voted to name its medical library in his memory. Dr. Tilderquist died in September, 1948, after 44 years of practice in Duluth. He was held in such high esteem that the county medical society, which had a very fine library already, voted to change the name and to set up an independent library corporation and begin a substantial library fund.

On January 11, 1951, the first annual meeting was held and a board of directors elected. Gifts to the amount of more than $10,000 were announced as a beginning library fund. Through the years it is hoped to build up an outstanding library with a substantial endowment fund and, in the future, possibly a building including an auditorium.

Dr. Tilderquist was born of immigrant parents in rural southern Minnesota. He was graduated from college in 1894 and from the University of Minnesota Medical School in 1903. In the long years of his practice, Dr. Tilderquist endeared himself to his patients and became to his fellow practitioners the "ideal physician." He was scholarly, scientific, and highly competent yet extremely modest; he was a hard worker and selfless to a high degree. He was the organizing spirit of the local eye and ear group and was unremitting in his efforts to keep the members studying. In all of his contacts, he was patient, friendly, kindly, and won the confidence and love of all whom he knew. The library bears his name rather to perpetuate and emphasize the qualities of the ideal physician than to honor an individual man.

Further honoring Dr. Tilderquist's memory there have been two memorial lectures given before the St. Louis County Medical Society. Dr. H. G. Kobrak of the University of Chicago gave the second lecture on November 9, 1950. This annual lectureship, it is expected, will be continued.

ANNOUNCEMENTS

PLASTIC SURGERY AWARDS

The Foundation of the American Society of Plastic and Reconstructive Surgery offers junior and senior awards for original contributions in plastic surgery.

Junior awards consist of two scholarships in plastic surgery of six and three months, respectively; the senior award is for the best essay on "Mass treating of burns in atomic warfare."

All entries must be received by the chairman not later than August 15, 1951. For further information write to: Dr. Jacques W. Maliniac, 11 East 68th Street, New York 21, New York.

ORTHOPTIC EXAMINATIONS

The annual examination of orthoptic technicians by the American Orthoptic Council will be conducted in September and October, 1951.

The written examination will be nonassembled and will take place on Thursday, September 6th, in certain assigned cities and offices and will be proctored by designated ophthalmologists.

The oral and practical examination will be on Saturday, October 6th, in Chicago just preceding the meeting of the American Academy of Ophthalmology and Otolaryngology.

Applications for examinations will be received by the office of the secretary of the American Orthoptic Council, Dr. Frank D. Costenbader, 1605 22nd Street, N.W., Washington 8, D.C., and must be accompanied by the examination fee of $30. Applications will not be accepted after July 1, 1951.

Pathology course

The department of ophthalmology, Washington University School of Medicine, Saint Louis, announces an intensive course in the pathology of the eye and adnexa given by Dr. T. E. Sanders. This course is of one week's duration, totaling about 40 hours, including both didactic and microscopic work. The course is limited to 10 students. Tuition is $125. Those interested may communicate with the department of ophthalmology, Washington University School of Medicine, 640 South Kingshighway, Saint Louis 10, Missouri.

Fellowships available

The department of ophthalmology, Tulane University of Louisiana School of Medicine, New Orleans announces that four fellowship are available for the coming year. In addition, there is a clinical research opening which entails working on a visual survey in the rural areas of Louisiana. For further information and details write to: Dr. William B. Clark, 211 Loyola Avenue, New Orleans 12, Louisiana.

Societies

Eye Institute meeting

At the recent meeting of the Alumni Association of the Institute of Ophthalmology, Presbyterian Hospital, New York, the following scientific papers were presented:

"The value of preoperative cultures in cataract extraction," Dr. John H. Dunnington and Dr. Locatcher Khorazo; "Hardy-Rand-Rittler polychromatic plates," Dr. LeGrand Hardy; "Diagnostic procedures in glaucoma," Dr. Willis Knighton; "Results of a survey to determine the best method of testing vision of school children," Dr. A. Lloyd Morgan; "A new radium applicator for the eye," Dr. Eliott B. Hague; "Periarteritis nodosa with unusual corneal complications," Dr. George N. Wise; "Rationale of electrosurgery in retinal detachment operations," Dr. Graham Clark.

"Early diagnosis of ocular type of multiple sclerosis," Dr. Otto Lowenstein; "Clinical observations with ACTH and cortisone in the Institute of Ophthalmology," Dr. Ira S. Jones; "Studies with cortisone in experimental animals," Dr. Ludwig von Sallmann; "Demonstration of teaching model of visual pathways," Dr. Sean Murphy; "Relation of thiol groups of lens proteins to cataract formation," Dr. Zacharias Dische; "Antibiotic-produced bacteria in the flora on the conjunctiva," Dr. Seymour Halbert; "Metabolism of the cornea," Dr. Andrew deRoetth, Jr.; "Experimental studies with polymyxin B on the eye," Dr. R. L. Wiggins.

VII Brazilian congress

The VII Brazilian Congress of Ophthalmology is to be held July 11th to 15th at Quitandinha near Rio de Janeiro. For further information write to: Dr. Moacyr Alvaro, Consolacao 1151, São Paulo, Brazil.

Joint meeting at Reading

The 10th annual joint meeting of the Reading Dental Society and the Reading Eye, Ear, Nose, and Throat Society was held April 18, 1951, at the Abraham Lincoln Hotel, Reading, Pennsylvania.

The speaker of the evening was Herbert K. Cooper, D.D.S., director of the Lancaster Cleft Palate Clinic, who presented an illustrated talk on the care and treatment of a cleft palate.

A study club was conducted on the topic of "Headaches and head pain of rhinologic origin." The following were instructors: Dr. H. Lionel Cunin, Allentown; Dr. E. A. Palmgren, Lancaster.

Delta scientific meeting

The Delta Ophthalmological Society held its initial scientific meeting February 22, 1951, in New Orleans, Louisiana.

Dr. Robb McDonald, Philadelphia, spoke on "Causes of failure in retinal detachment operations"; Dr. Frank Newell, Chicago, spoke on "The experimental effects of cortisone on wound healing"; and Dr. Irving Leopold, Philadelphia, spoke on "The experimental studies of cortisone."

Vienna societies honor Fuchs

The Vienna Medical Society joined the Ophthalmological Society of Vienna in commemorating the centenary of the birth of Ernst Fuchs, June 21, 1951, in special meetings during which a marble relief of the famous ophthalmologist by J. Müllner was unveiled at the university.

Brooklyn program

The 116th regular meeting of the Brooklyn Ophthalmological Society was held at the Brooklyn Eye and Ear Hospital. On the program were: Dr. Regina Gilroy, "Congenital corectopia with pigmentation of endothelium of the cornea"; Dr. Walter V. Moore, "Agranulocytosis following cataract extraction and the use of pyribenamine"; Dr. Edwin N. Beery, "Sarcoma of the inferior rectus muscle"; Dr. John S. Aiello, "Lupus erythematosis"; Dr. Stanley Golden, "Corneal abscess treated with subconjunctival injections of penicillin"; Dr. Seymore Goodstein, "Congenital cyst of the lacrimal sac." The motion picture, "Embryology of the eye," was shown.

Personals

Dr. Eugene M. Blake retires at the end of June as clinical professor of ophthalmology and head of the department of ophthalmology at the School of Medicine of Yale University. Dr. Blake completes an association with the school of 44 years.

PRESCRIPTION OPTICIANS

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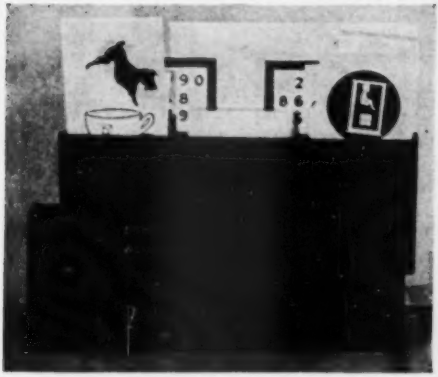

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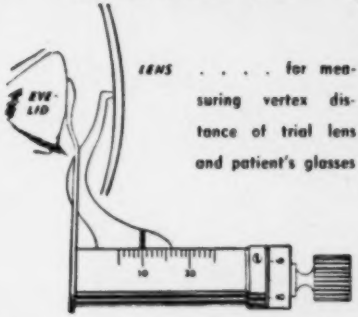
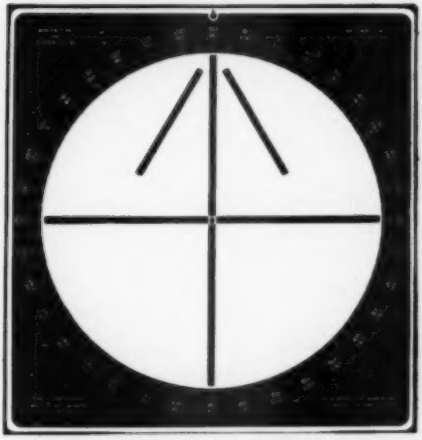


. . . . for measuring vertex distance of trial lens and patient's glasses

Use of Lenscorometer in all cases of aphakia, + OR — corrections of four diopters or more—a necessity to insure true translation of prescription.

Each $11.75



(Actual size 13½" x 14")

SIMPLIFIED ASTIGMOMETER

(Lebensohn)

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WASHABLE

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